Groundwater Pumping/ Water Transfer Project for 25 Consecutive Years

Environmental Assessment/Initial Study

July 3, 2007

Prepared for:

U.S. Department of the Interior
Bureau of Reclamation
Sacramento and Fresno, California

and

San Joaquin River Exchange Contractors Water Authority
Los Banos, CA 93635

Prepared by:

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ENVIRONMENTAL CONSULTANTS

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Appendices

Tables

Figures

Acronyms and Abbreviations

µg/m3	microgram per cubic meter
µm	microns
AF	acre-feet
AFY	acre-feet per year
APCDs	air pollution control districts
APE	area of potential effects
AQCR	Air Quality Control Regions
AQMDs	air quality management districts
ARB	Air Resources Board's
ATC	Authority to Construct
ATCM	Air Toxics Control Measure
BA	biological assessment
BACT	Best Available Control Technology
BARCT	Best Available Retrofit Control Technology
BHP	brake horsepower
CAA	Clean Air Act
CAAQS	California Ambient Air Quality Standards
CARB	California Air Resources Board
CCID	Central California Irrigation District
CDFG	California Department of Fish
CEQA	California Environmental Quality Act
CESA	California Endangered Species Act
CFR	Code of Federal Regulations
cfs	cubic feet per second
CHRIS	California Historical Resources Information System
CO	Carbon Monoxide
CO_2	Carbon Dioxide
CRHR	California Register of Historical Resources

CRLF	California red-legged frog
CTS	California tiger salamander
CVP	Central Valley Project
CVPIA	Central Valley Project Improvement Act of 1992
CWHR	California Wildlife Habitats Relationship System
DMC	Delta-Mendota Canal
DPM	Diesel Particulate Matter
DPS	Distinct Population Segment
DWR	Department of Water Resources
EA	Environmental Assessment
EAC	Early Action Compact
EFH	Essential Fish Habitat
EIR	Environmental Impact Report
EIS	Environmental Impact Statement/
ESA	Endangered Species Act
Exchange Contractors	San Joaquin River Exchange Contractors Water Authority
FCWD	Firebaugh Canal Water District
FESA	Federal Endangered Species Act
FLI	Farmland of Local Importance
FONSI	Finding of No Significant Impact
FSI	Farmland of Statewide Importance
FSOR	Final Statement of Reasons
g/BHP-hr	Grams Per Brake Horsepower Hour
g/KW-hr	Grams Per Kilowatt Hour
g/sec	gram per second
GDA	Grassland Drainage Area
HAPS	Hazardous Air Pollutants
HCPs	Habitat Conservation Plans
Interior	U.S. Department of the Interior
I-O	input-output

IS	Environmental Assessment/Initial Study
IS	Initial Study
ITAs	Indian Trust Assets
IV/WNLR	In-Valley/Water Needs Land Retirement Alternative
KW	Kilowatt
LTCR	long-term contract renewal
M&I	municipal and industrial
MACT	Maximum Achievable Control Technology
mg/l	milligrams per liter
mg/m^3	milligrams per cubic meter
MOU	Memorandum of Understanding
NAAQS	National Ambient Air Quality Standards
NAICS	North American Industrial Classification System
NEPA	National Environmental Policy Act
NH_4OH	ammonium hydroxide
NO_2	Nitrogen Dioxide
NOAA	National Oceanic & Atmospheric Administration
NO_X	Nitrogen Oxides
NRHP	National Register of Historic Places
NSCR	nonselective catalytic reduction
NSPS	New Source Performance Standards
NSR	New Source Review
NWR	National Wildlife Refuge
O&M	Operations and Maintenance
O_3	Ozone
OCAP	Operations Criteria and Plan
Pb	Lead
PFR	Plan Formulation Report
PM	Particulate Matter
PM_{10}	Particulate Matter less than 10 microns

$PM_{2.5}$	Particulate Matter less than 2.5 microns
PPE	personal protective equipment
ppm	parts per million
PSD	Prevention of Significant Deterioration
PTE	Potential to Emit
PTO	Permit to Operate
Reclamation	U.S. Bureau of Reclamation
ROC	Reactive Hydrocarbons
ROD	Record of Decision
RWQCB	Regional Water Quality Control Board
SB	State Bill
SCAQMD	South Coast Air Quality Management District
SCR	selective catalytic reduction
SCVWD	Santa Clara Valley Water District
Se	selenium
Service	U.S. Fish and Wildlife Service
SHPO	State Historic Preservation Office
SIC	Standard Industrial Classification
SIPs	State Implementation Plans
SJVAB	San Joaquin Valley Air Basin
SJVAPCD	San Joaquin Valley Air Pollution Control District
SLDFR	San Luis Drainage Feature Re-evaluation
SLWD	San Luis Water District
SO_2	sulfur dioxide
SOx	Sulfur Oxides
SSJVIC	ozone (O_3 Southern San Joaquin Valley Information Center
TDS	total dissolved solids
TSP	Total Suspended Particulate
USC	United States Code
USEPA	U.S. Environmental Protection Agency

USFWS	U.S. Fish and Wildlife Service
UV	ultraviolet
VOC	Volatile Organic Compound
WMA	Wildlife Management Area

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1.0 PURPOSE AND NEED

This Environmental Assessment/Initial Study (EA/IS) examines the environmental effects of a groundwater pumping/water supply project that involves the transfer of up to 20,000 acre-feet (AF) of substitute water[1] from two members of the San Joaquin River Exchange Contractors Water Authority (Exchange Contractors)[2] to other Central Valley Project (CVP) water contractors[3] for irrigation and municipal and industrial uses. Two members of the Exchange Contractors, Firebaugh Canal Water District (FCWD) and Central California Irrigation District (CCID), propose to make available up to 20,000 AF annually for transfer for a 25-year period. The primary source of this water is groundwater pumping to manage drainwater production. A secondary source of this water is conservation,[4] and a third and "last priority" source of this water is the temporary fallowing of land where such land fallowing would benefit/control shallow groundwater levels and the production of drainwater.

The U.S. Department of the Interior (Interior), Bureau of Reclamation (Reclamation) is the Federal lead agency for preparation of this Environmental Assessment (EA) pursuant to the National Environmental Policy Act (NEPA). The Federal action is that Reclamation would need to review and approve each new transfer to ensure that the transfer meets applicable Federal and State laws, including policies and procedures governing transfer of CVP surface supplies.

The Exchange Contractors are the lead agency for the State (for FCWD and CCID), and have prepared this Initial Study (IS) pursuant to the California Environmental Quality Act (CEQA) to examine the environmental impacts of the drainage control/water supply project over the long term and the subsequent transfer of a portion of their CVP water.

1.1 History and Background

The proposed groundwater pumping/water transfer project has its origins in both the need for additional water supplies for CVP contractors and in the need for drainwater control in FCWD and CCID portions of the Exchange Contractors service area.

In several recent years since 1992, CVP contractors have received less than 75 percent of their total contract amounts (i.e., water years 1993, 1994, 1999, 2000, 2001, 2002, and 2004).

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[1] The transfer involves "substitute water" because the Exchange Contractors' water supply involves the substitution of Central Valley Project water in lieu of surface water diversions from the San Joaquin River in most years.

[2] The San Joaquin River Exchange Contractors Water Authority consists of Central California Irrigation District, San Luis Canal Company, Firebaugh Canal Water District, and Columbia Canal Company. These entities are commonly known as the "Exchange Contractors."

[3] CVP water contractors would be San Luis Unit contractors (Pacheco Water District, Panoche Water District, San Luis Water District, and Westlands Water District) and San Felipe Division Contractor, the Santa Clara Valley Water District.

[4] Conservation measures to develop water include canal lining and source/drainwater control measures, which would result in a savings of water to a saline sink, and do not include tailwater recovery.

Since passage of the Central Valley Project Improvement Act (CVPIA) in 1992 with its changes in CVP management to redirect 800,000 AF of yield to environmental protection, restoration, and enhancement, some CVP water service contractors experience supply shortages. The proposed water transfer from the Exchange Contractors is needed to assist in meeting shortages by the districts that would participate in the transfer. The primary means for water development is proposed to be groundwater pumping.

The application of irrigation water upslope has resulted in increased pressures transmitted downslope into the Exchange Contractors' service area. The pressure causes poor-quality water to rise into crop root zones and drainage systems within the Exchange Contractors' service area (C. White, pers. comm., 2006). Furthermore, two areas within the Exchange Contractors service area, FCWD and the Camp 13 area of CCID (as shown on the map included in Section 2, Figure 2-3), are currently affected by the shallow groundwater levels which reach the crop root zone. A locally sponsored program is needed to maintain the viability of agriculture in these drainage-impacted areas within CCID and FCWD. FCWD and Camp 13 need to undertake actions to pump groundwater and transfer a commensurate portion of their CVP supply (substitute water) to provide a funding mechanism to assist in the implementation of capital improvement projects pursuant to the *San Joaquin River Exchange Contractors Water Authority Water Transfer Policy Relating to Drainage Projects*, adopted September 3, 2004.

Recently, water development projects (groundwater pumping) have been determined to be feasible in the area, which is the subject of this EA/IS. In 2002, the Exchange Contractors implemented a pilot project, in cooperation with Reclamation, to study the feasibility of using groundwater pumping as a tool to assist in managing groundwater levels in lands that have a perched water table. Two wells were installed in the Sierran Sands aquifer above the Corcoran Clay but perforated below the shallow groundwater level containing selenium. This pumped groundwater contained predicted elevated levels of salinity but no selenium. The pumped groundwater was diverted into a surface supply canal and put to beneficial use on downstream lands. Monitoring of the shallow groundwater levels and discharges of nearby tile sumps was conducted. The result was a lowering of shallow water levels and reductions in the nearby tile sump outputs, and the groundwater was found to be usable and could be marketed to help fund additional wells and drainage reduction measures.

In December 2004, Reclamation and the Exchange Contractors completed a Final Environmental Impact Statement/Environmental Impact Report (Final EIS/EIR) on a water transfer program for up to 130,000 AF for water service years 2005-2014 involving the entire Exchange Contractors' service area (240,000 acres). This water transfer program developed the water primarily from conservation measures and tailwater recovery, but also from groundwater pumping and temporary land fallowing. It made the water available for transfer to other CVP contractors, the San Joaquin Valley wildlife refuges, and the Environmental Water Account to the extent that CVP operations would benefit. (Reclamation 2004a)

The Proposed Action/Proposed Project evaluated herein differs from the transfer program above because the primary method for developing the water is localized groundwater pumping. Furthermore, an additional purpose for the project is to develop a water supply for transfer that would provide funding for managing shallow groundwater levels within a

portion of the Exchange Contractors' service area and implementation of capital improvements. Only drainage-impaired areas of approximately 28,000 acres within the two districts would be involved in water development. The application of the pumped groundwater to CCID agricultural lands frees up commensurate surface water supplies for use by other CVP contractors as a transfer. None of the transfer water is proposed for other Federal uses such as the San Joaquin Valley wildlife refuges or the Environmental Water Account considered in the 2005-2014 transfer program. The transfer water for this new program would be used by San Luis Unit (West San Joaquin Division) contractors and Santa Clara Valley Water District (San Felipe Division).

1.2 Purpose and Need/Project Objectives

The purpose and need of the Proposed Action/Proposed Project is to develop a water supply for transfer from the Exchange Contractors' service area of up to 20,000 AF annually that will assist in meeting the internal demands of certain CVP urban and agricultural water users to alleviate water supply shortages and provide capital improvement funding to control drainwater production in areas affected by shallow groundwater. Water development activities, primarily groundwater pumping, on approximately 28,000 acres of agricultural lands would allow for an annual transfer of CVP water from the Exchange Contractors to other CVP water users. The water for transfer would be developed first from groundwater pumping. If groundwater pumping is not sustainable or cannot occur for any reason, then the water would be developed from conservation projects that would result in a savings to a saline sink. Lastly, if both of these sources of water development cannot produce a sufficient supply, rotational land fallowing would be used. The proposed water development activity and subsequent transfer will accomplish the following objectives:

- Make water available for beneficial use by other CVP agricultural and municipal and industrial (M&I) water users in West San Joaquin and San Felipe Divisions;
- Ensure that groundwater, surface water, and conserved water in the Exchange Contractors' service area are managed conjunctively to maximize beneficial use;
- Intercept poor quality groundwater before it reaches wells north of the area and in Madera County; and
- Achieve a long-term, sustainable salt and water balance in the root zone of irrigated lands in two affected areas of the Exchange Contractors' service area in order to continue farming in these areas beyond the termination of the Grassland Bypass Project, which presently provides for discharges to the San Joaquin River under a waste discharge permit through 2009.

The **CVP San Luis Unit agriculture service contractors** who could benefit from supplemental water supplies such as those from the proposed water transfer are: Pacheco Water District, Panoche Water District, San Luis Water District, and Westlands Water District. The availability of water for plant use during the growing season (primarily April through October) is the most limiting factor in crop production. Short water supplies reduce crop yields and quality and increase the risks of farming. Adequate irrigation increases the level and uniformity of crop yields and improves crop quality, thereby reducing these

economic risks. In part of the western and eastern San Joaquin Valley, farmers have been irrigating cropland for more than 120 years. With the increased availability of groundwater and surface water, the acreage of irrigated cropland in the San Joaquin Valley has increased more than 80 percent since the 1950s (Exchange Contractors 1997a).

Local **CVP municipal and industrial (M&I) uses** in Santa Clara Valley Water District (SCVWD) and/or San Luis Water District (SLWD) could also benefit from the Proposed Action, especially in years when full contract deliveries cannot be made. However, even in years when full contract deliveries are made available, the districts' internal demands are greater, thereby providing for the need of additional supplemental supplies.

- The CVP provides up to 152,500 AFY to SCVWD (119,400 AFY for M&I needs and 33,100 AFY for agricultural needs). (Reclamation 1977, 2004e)
- For SLWD, the CVP provides up to 125,080 AF (2,000 AFY for M&I needs and 123,080 AFY for agricultural needs). (Reclamation 2005b)

Reclamation Water Shortage Policy provides M&I water supplies with a 75 percent water supply reliability based on a contractor's last three years of water deliveries unconstrained by the availability of CVP water. This "historical use" can be adjusted for growth, extraordinary water conservation measures, and non-CVP water. (Reclamation 2004d)

In summary, the purpose and need is twofold: 1) developing funding mechanisms to implement capital improvements, and 2) providing a source of water through transfers to certain CVP users to meet internal demands.

1.3 Related Plans and Projects

Water transfers and/or exchanges occur throughout California and are an important component of the water market and management of water supplies to maximize beneficial use. Documents cited below are incorporated by reference into this EA/IS, because they provide information that is substantive to the alternatives, environmental impacts, and conclusions contained in later sections of this document. Several plans, programs, and activities are underway that are related to the water transfer and water development components of the Proposed Action, and these are part of the cumulative impacts analysis.

1.3.1 CVP Long-Term Water Service Contract Renewal for San Luis Unit

The CVP's West San Joaquin Division, San Luis Unit covers 600,000 acres located in the western portion of Fresno, Kings, and Merced counties. The Unit encompasses the entire Westlands, Broadview, Panoche, and Pacheco Water Districts and the southern portion of the San Luis Water District. The first *San Luis Unit, Long-Term Contract Renewal Draft Environmental Impact Statemen*. The revised Draft EIS was available for public review in September 2005 (Reclamation 2005c) and may be revised again and finalized in 2008 when the CVP/SWA Operations Criteria and Plan (OCAP) is approved.

1.3.2 CVP Long-Term Water Service Contract Renewal for San Felipe Division

Santa Clara Valley Water District (SCVWD) is part of the CVP San Felipe Division which covers the Santa Clara Valley in Santa Clara County, the northern portion of San Benito County, the southern portion of Santa Cruz County, and the northern edge of Monterey County. Only water users in Santa Clara Valley Water District would benefit from the Proposed Action/Proposed Project. The current SCVWD CVP contract extends to 2027. See also the *Long-Term Renewal of the Contract Among the United States and the Pajaro Valley Water Management Agency, Westlands Water District Distribution District No. 1, and Santa Clara Valley Water District Providing for Central Valley Project Water Service* (Contract No. 14-06-200-3365A) (Reclamation 2004b).

1.3.3 Grassland Bypass Project

The Exchange Contractors' affected areas of FCWD and CCID are part of the larger Grassland Drainage Area (GDA). The GDA farmers are implementing several drainage control activities including the Grassland Bypass Project. *The Grassland Bypass Project Final EIS/EIR, May 25, 2001,* addresses the environmental effects of the collection of drainwater from the 97,400-acre GDA and the adjacent 1,100-acre Camp 13 area and conveyance of that drainwater in the San Luis Drain to its discharge into Mud Slough (North) until October 1, 2009 (Reclamation and San Luis & Delta Mendota Water Authority 2001). Subsurface drainage discharges from the GDA into the Camp 13 Slough and other wetland channels have been eliminated since 1998.

1.3.4 Westside Regional Drainage Plan

A collaborative effort of the Exchange Contractors and Panoche, Westlands, and Broadview Water Districts, this drainage plan was submitted to Reclamation in March 2003. The Plan's drainage service area includes the Exchange Contractors Sub-area which is the same as the 28,000 acres of drainage-impacted area that is proposed for the water development activities of groundwater pumping, conservation, and temporary land fallowing in this water transfer EA/IS. The Westside Plan includes groundwater pumping as a measure to reduce drainage production within the Exchange Contractors service area. It focuses on projects that can be implemented quickly. Major Plan components include land retirement, groundwater management, source control, regional re-use, treatment, and salt disposal.

1.3.5 San Luis Drainage Feature Re-evaluation

The Re-evaluation (or SLDFR) has estimated drainage quantity and quality from the San Luis Unit and has identified seven action alternatives for drainage management and disposal, including several components of the Westside Plan identified above. The focus is on drainwater with a high selenium content that needs careful management to avoid large-scale adverse environmental effects in the San Joaquin River and Tulare Lake basins. Reclamation prepared a Draft Environmental Impact Statement, released in May 2005, and circulated the Final EIS in June 2006 (Reclamation 2006). The Record of Decision (ROD) was signed March 9, 2007 (Reclamation 2007a).

The Re-evaluation is to provide drainage service to the San Luis Unit. It assumes on-farm, in-district actions to reduce drainage production. These drainwater reduction measures may include groundwater pumping. Remaining drainage after these drainwater reduction measures is part of the Federal action/SLDFR project.

The SLDFR Plan Formulation Report (PFR) Addendum included the Westside Regional Drainage Plan as a "locally preferred" alternative (LP1, Table 3-1), and major features of this alternative were incorporated into the In-Valley/Water Needs Land Retirement Alternative (IV/WNLR). The IV/WNLR Alternative was formulated to incorporate major features of the Westside Plan (i.e., future phases of the Grassland Integrated Drainage Management Project, land retirement in Westlands Water District), and it is evaluated in the EIS. Reclamation selected the IV/WNLR Alternative for implementation (Reclamation 2007a).

1.3.6 A Management Plan for Agricultural Subsurface Drainage and Related Problems on the Westside San Joaquin Valley

This final report of the San Joaquin Valley Drainage Program (SJVDP 1990) is known as the Rainbow Report. The recommended plan included a groundwater management component as follows: "Planned pumping from deep within the semi confined aquifer, in places where near-surface water tables can be lowered and the water pumped is of suitable quality for irrigation or wildlife habitat" (SJVDP 1990, p. 3). Most of the pumping is from below the Corcoran Clay and provides storage space for deep percolation.

1.3.7 Concepts for Collaboration Drainage Resolution

Given the uncertainty, timing, and cost of implementing drainage service to the San Luis Unit and areas immediately adjacent to the Unit, Reclamation and affected parties are evaluating alternatives to Reclamation providing drainage service referred to in Section 1.3.5 above. Several concepts are currently under discussion and will require further analysis. These concepts include measures described in Section 1.3.4 as well as other ideas such as transferring of title of certain CVP facilities and assumption of the drainage obligation by the irrigation contractors. (Reclamation 2007b)

2.0 ALTERNATIVES

NEPA uses the term "action alternatives," while CEQA uses "project alternatives." For this combined NEPA/CEQA document, the alternatives will be called action alternatives throughout the remainder of this document with the term "project" implied. This section provides a description of the project location, the No Action Alternative, and three Action Alternatives. It concludes with a description of required agency approvals and mitigation measures incorporated into the Proposed Action.

2.1 Project Background and Location

The project area is located in the San Joaquin Valley of central California, on the west side of the San Joaquin River. Figure 2-1 is a regional map with key hydrologic features that shows the general location of the project area, which is comprised of both the areas developing the water and areas that may receive the water through transfer. The Exchange Contractors' service area covers 244,000 acres of agricultural land and is shown on Figure 2-2. It includes the following four districts: CCID, San Luis Canal Company, FCWD, and Columbia Canal Company. The Exchange Contractors service area is located in Stanislaus, Merced, Madera, and Fresno counties.

The drainage-impacted areas that would develop the water for transfer (28,000 acres within the Grassland Drainage Area) are within CCID, including the Camp 13 Drainage Area, and FCWD. The CVP agricultural water users who could receive the water are within part of the San Luis Unit (comprised of Pacheco Water District, Panoche Water District, the San Luis Water District, and Westlands Water District); and the municipal and industrial (M&I) water users that may receive water are San Luis and Santa Clara Valley Water Districts. These water development and receiving areas are shown on Figure 2-3. The water development areas are located in Fresno, Merced, and Stanislaus counties. The transfer water receiving areas are located in Merced, Fresno, Kings, and Santa Clara counties.

2.2 No Action Alternative

The No Action Alternative (under NEPA) is described as the future without the Federal action. It includes past actions, other present actions, and reasonably foreseeable actions. It excludes any of the Action Alternatives described herein from being implemented. Under NEPA, the No Action Alternative provides a benchmark enabling the decision maker to compare the magnitude of the environmental effects of the Action Alternatives.

The No Project Alternative under CEQA is the condition under which the project does not proceed. It is the extension of existing conditions into the reasonably foreseeable future assuming implementation of already approved projects. It needs to be evaluated against the existing condition in an EIR, but it is not the baseline for determinations of significance for either an EIR or an Initial Study/Negative Declaration. Under CEQA, the basis for determining the significance of environmental impacts is the existing physical condition of the resource under evaluation without future projects being considered.

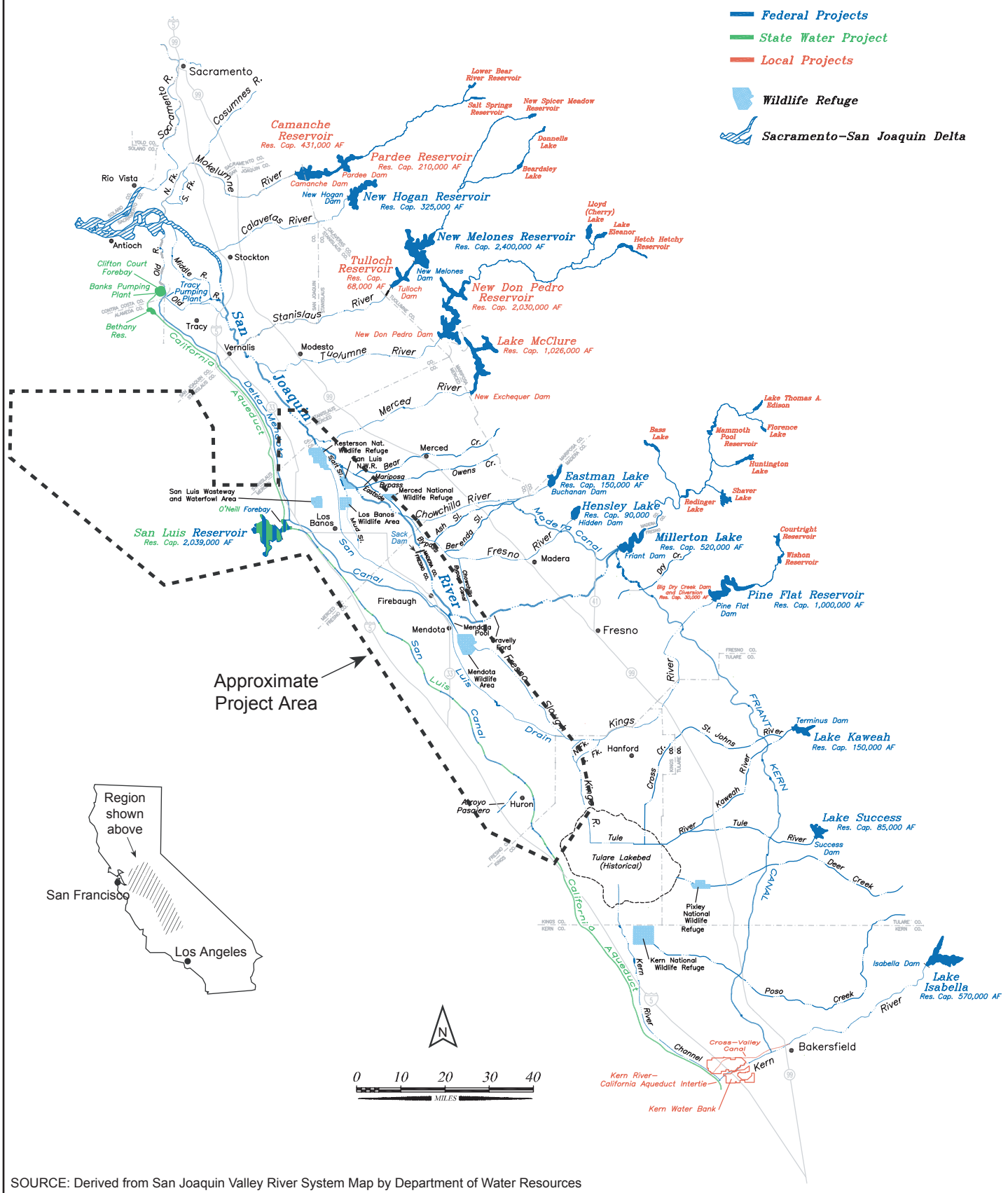
The No Action Alternative for this EA/IS would be no new wells and, therefore, no additional groundwater pumping, conservation, or temporary land fallowing activities for FCWD and Camp 13 and no transfer of water from CCID and FCWD to the other CVP water users.

- The Exchange Contractors would pump groundwater consistent with the recently approved transfer program for 2005–2014, allowing up to 20,000 acre-feet (AF) of groundwater pumping in noncritical water years. However, there would be no groundwater pumping in FCWD and the Camp 13 area of CCID.
- There would be no additional temporary land fallowing beyond the rotational land fallowing that is part of the approved transfer program for 2005–2014. Rather, without groundwater pumping to control drainage production and no other capital improvements to resolve drainage problems, there would be land retirement in the affected areas of FCWD and CCID.
- The Exchange Contractors have progressively developed water conservation/tailwater recapture facilities within their service area with the express purpose of providing quantities of water for transfer. Absent additional transfers, the Exchange Contractors anticipate the continuation of the use of the facilities for their own internal operation needs and to meet other transfer obligations. Therefore, under the No Action/No Project Alternative, it is assumed that the Exchange Contractors will continue to operate the facilities to the extent currently used for transfers.
- CCID's participation in these current transfers is 35,000 AF, and FCWD's participation is up to 10,000 AF, on an annual basis.
- Agricultural and M&I water users would get their CVP contractual supplies subject to the limitations in their water service contracts. These contractual supplies are presented in Table 2.2-1.

Table 2.2-1 Existing CVP Contracts in Water Receiving Areas

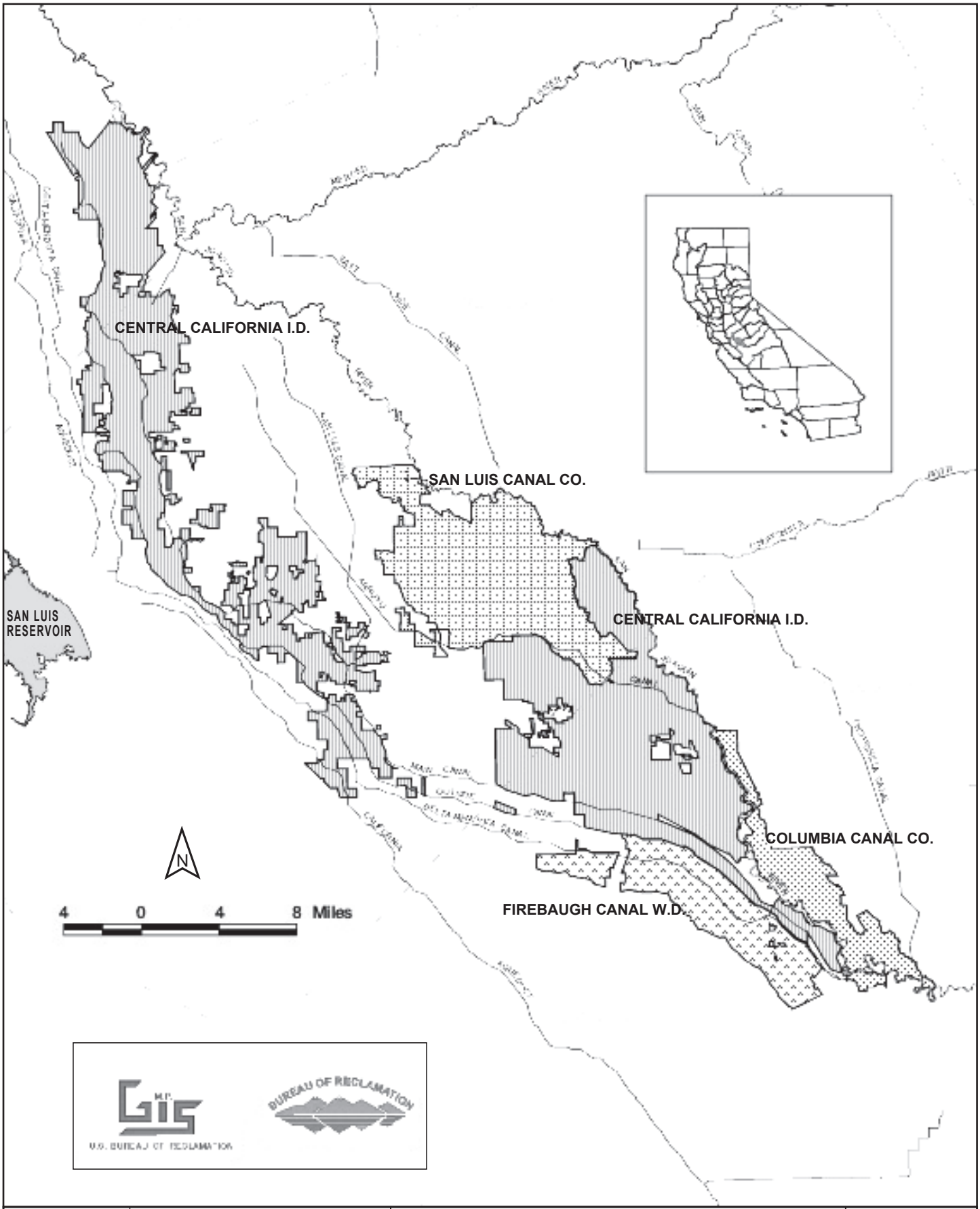
District	Contract Quantity (AFY)	Purpose of Use
Pacheco WD	10,080	Ag/M&I
Panoche WD	94,000	Ag/M&I
San Luis WD	125,080	Ag/M&I
Westlands WD	1,150,000	Ag/M&I
Santa Clara Valley WD	152,500	Ag/M&I

Sources: R. Eckart, Bureau of Reclamation (May 25, 2007), pers. comm.; J. Tapia, Bureau of Reclamation (May 28, 2007), pers. comm.; S. Carter, Bureau of Reclamation (June 20, 2007), pers. comm.

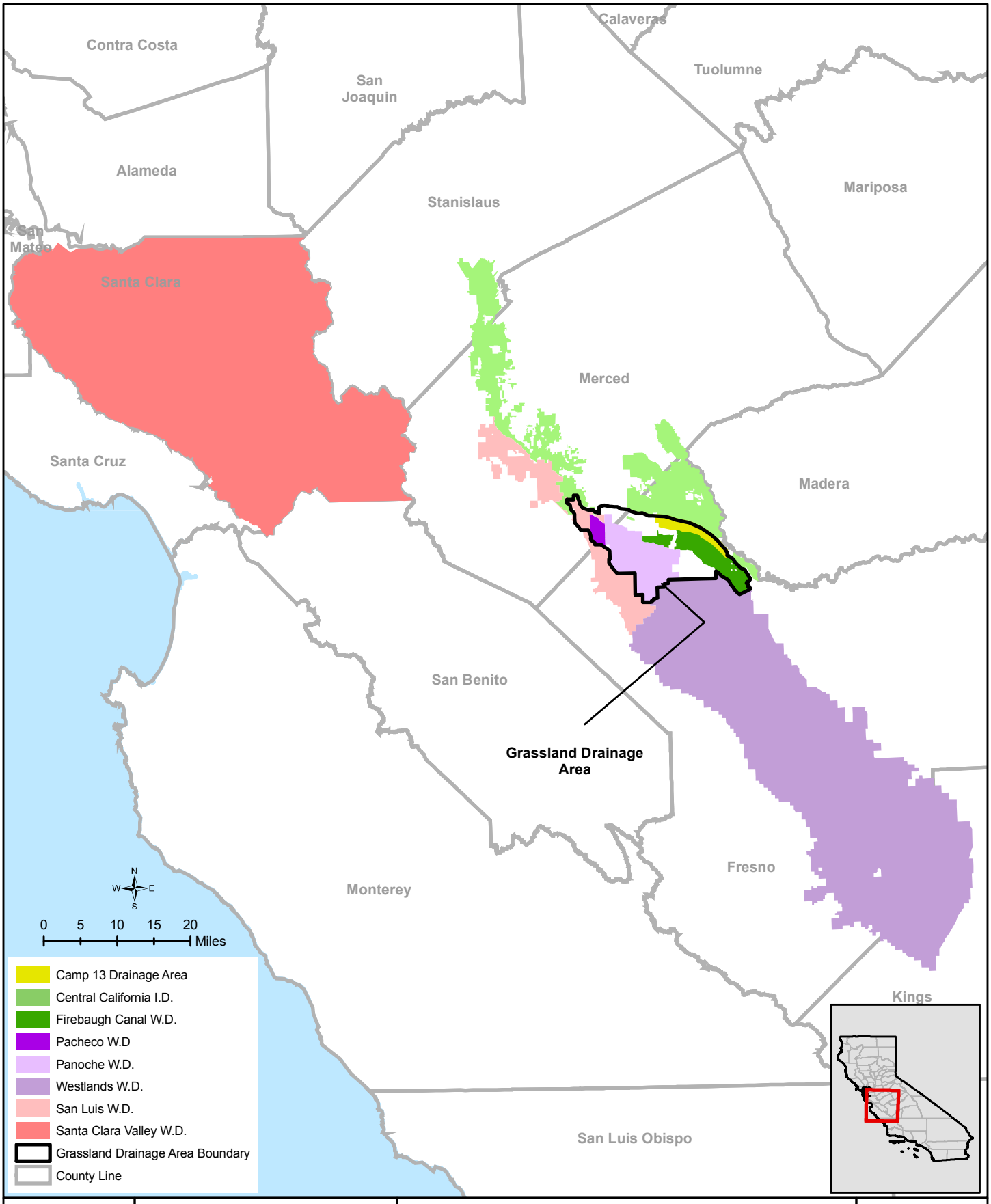


SOURCE: Derived from San Joaquin Valley River System Map by Department of Water Resources

Project No. 3132501	**ENVIRONMENTAL ASSESSMENT/ INITIAL STUDY**	SAN JOAQUIN VALLEY REGION WITH PROJECT AREA AND VICINITY	Figure 2-1



Project No. 3132501	**ENVIRONMENTAL ASSESSMENT/ INITIAL STUDY**	SAN JOAQUIN RIVER EXCHANGE CONTRACTORS WATER AUTHORITY SERVICE AREA	Figure 2-2



Project No. 3132501	**ENVIRONMENTAL ASSESSMENT/ INITIAL STUDY**	WATER DEVELOPMENT AND RECEIVING AREAS	Figure 2-3

These contracts provide for mixed usage, i.e., irrigation and M&I purposes. These districts could use all of the water for M&I purposes if the appropriate NEPA and Endangered Species Act (ESA) compliance has been done to allow for this use. It is unlikely that this quantity of M&I use would occur due to commitments to provide irrigation water to district farmers (S. Carter, Bureau of Reclamation [May 24, 2007], pers. comm.). Santa Clara Valley Water District has fixed amounts of water designated for irrigation (33,100 AF) and M&I (119,400 AF). The remaining contractors are "mixed usage" and can use the entire contract total for either or both purposes.

Panoche, San Luis, and Westlands Water Districts' CVP water service contracts are set to expire in 2007 or 2008; Reclamation is preparing interim contracts to allow for sufficient time to finalize the necessary long-term environmental documentation to execute renewal of the long-term contracts. Under No Action, the current contracts' major provisions are assumed to continue for the foreseeable future.

Table 2.2-2 presents the recent history of water supply allocations to the Exchange Contractors and South of Delta CVP agricultural and M&I water users since 1992 when CVPIA was implemented. These allocations over the various water year types represent the allocations that have occurred for M&I users (77 to 100 percent) and agricultural users (35 to 100 percent).

Table 2.2-2 CVP Water Supply Allocations South of Delta, 1992-2006

Water Year	San Joaquin River Exchange Contractors	M&I Contractors, Percent of Total Contract Supply	Irrigation Contractors, Percent of Total Contract Supply
1993	100	75 (% of historical use)	50
1994	75	75 (% of historical use)	35
1995	100	100	100
1996	100	100	95
1997	100	90-100	90
1998	100	100	100
1999	100	95	70
2000	100	90	65
2001	100	77	49
2002	100	95	70
2003	100	100	75
2004	100	95	70
2005	100	100	85
2006	100	100	100

Source: R. Eckart, Bureau of Reclamation (April 2, 2007), pers. comm.

Water service reliability for the Exchange Contractors for agricultural supplies ranges from 650,000 to 840,000 AFY, and their contract does not provide for M&I uses within the Exchange Contractors service area. Reclamation and the Exchange Contractors are parties to the Second Amendatory Contract for Exchange of Waters, Contract No. I1r-1144 (Contract), dated February 14, 1968, and incorporated by reference into this EA/IS. Under the Contract, the United States supplies the Exchange Contractors with a substitute supply of CVP water to be used in lieu of their rights to certain waters of the San Joaquin River. Pursuant to the terms of the Contract, up to 840,000 AF of substitute CVP water per year is made available for irrigation purposes by Reclamation from the Sacramento River and the Delta, and other sources through the CVP, and up to 650,000 AF in critical dry years. The Exchange Contractors operations consist of the diversion of substitute water from the Delta-Mendota Canal, the Mendota Pool, and possibly the San Joaquin River and north fork of the Kings River. Some flexibility of operation is possible, but pursuant to the Contract, delivery amounts may not exceed certain specified monthly and seasonal maximums. Without any of the current and proposed transfers, the Exchange Contractors would divert all of their substitute water supply.

M&I reliable deliveries are subject to Reclamation's Municipal and Industrial Water Shortage Policy, Central Valley Project, California (Water Shortage Policy) (Reclamation 2005a, 2005b). This proposed policy defines current water shortage provisions applicable to agricultural and M&I service contracts. In most cases, irrigation water supplies would be reduced below 75 percent before M&I supplies are reduced.

Water service reliability for the districts receiving M&I water is summarized as follows:

- **Santa Clara Valley Water District.** The 2025 water demand for SCVWD recognizes 152,500 AF for both irrigation and M&I uses, as their contract supplemental supply (Reclamation 2005b). Of this amount, 33,100 AF from the CVP is for agricultural purposes (38 percent) and the remaining 119,400 AF would be used to meet a portion of the total M&I water demand estimated at 549,995 AF (Reclamation 1977, 2005b).
- **San Luis Water District.** The 2025 water demand for SLWD is 125,080 AF for both irrigation and M&I uses. The M&I demand was estimated at 2,000 AF: 1,200 AF for residential (for a population of 4,300) and 800 AF for commercial users located along Interstate 5 (Reclamation 2005b). The SLWD's long-term CVP water supply of 125,080 AFY is subject to annual allocations based on water year type and agricultural use shortage criteria. In a wet year, the allocation would be 100 percent, but in other years could be as little as 0-25 percent (see discussion below of shortages for South of Delta contractors). To compensate for the limited reliability of the supply and the potential for CVP supplies to be used for M&I purposes, SLWD requires potential M&I users to secure water supplies at a 4:1 ratio, meaning four times the needed supply (MWH/McIntyre 2006).

Allocations to M&I water service contractors may be less than CVP contract totals in years where hydrologic conditions produce water supply shortages and irrigation water allocations would be less than 75 percent. Prior to finalization of a water shortage policy for agricultural and M&I uses South of Delta, the Operations Criteria and Plan (OCAP) uses the following allocations (Reclamation 2004d):

If Ag is at 100% to 75%, the M&I is at 100%.

Ag 70%	M&I 95%
Ag 65%	M&I 90%
Ag 60%	M&I 85%
Ag 55%	M&I 80%
Ag 50% to 25%	M&I 75%

Dry and critical years have a modeling assumption.

Ag 20%	M&I 70%
Ag 15%	M&I 65%
Ag 10%	M&I 60%
Ag 5%	M&I 55%
Ag 0	M&I 50%

2.3 Action Alternatives

This section explains three action alternatives, the Proposed Action, the Alternative Action – Groundwater Pumping Only, and the Alternative Action without Groundwater Pumping. For all Action Alternatives, two districts of the Exchange Contractors, FCWD and CCID, specifically the lands in the Camp 13 Drainage Area of CCID, propose to make available up to 15,000 or 20,000 acre-feet/year (AFY) for transfer in accordance with the Exchange Contractors policy entitled *San Joaquin River Exchange Contractors Water Transfer Policy Relating to Drainage Projects* adopted September 3, 2004. Only drainage-impacted areas within the two districts would be involved in water development, i.e., approximately 28,000 acres.

Water transferred under any of the Action Alternatives would be used for existing land uses. Before any of the transferred water could be used for new developments in SLWD (or SCVWD), appropriate environmental compliance will be completed. This may include NEPA and ESA Section 7 and/or Section 10 compliance. Any transferred water above the districts' CVP contractually identified amounts of M&I water cannot be obtained from CCID and FCWD until NEPA and ESA compliance is completed by SLWD (or SCVWD) and Reclamation. ESA compliance includes completion of Biological Opinions and finalization of ongoing and potential Habitat Conservation Plans (HCPs) to address the impacts of urban development.

The duration of the Proposed Action is for 25 consecutive Water Years. This water would be in addition to the Exchange Contractors' recent 10-year transfer program of up to 130,000 AF for 2005–2014.

The potential sources of developed water are:

- First priority is **groundwater pumping**;

- Secondarily **water conservation projects** (canal lining and drip irrigation) that would result in a savings to a saline sink; and
- Thirdly, the temporary (rotational) **fallowing of land** where such actions would benefit/control shallow groundwater levels.

Reasonable action alternatives were considered to include these three sources. The three Action Alternatives described below represent a range of options with the Alternative Action without Groundwater Pumping representing the maximum case for reliance on conservation and land fallowing methods of water development.

2.3.1 Proposed Action

The Proposed Action transfer would allow for delivery of up to 20,000 AFY to any or all of the following users:

- CVP San Luis Unit agriculture service contractors, up to 20,000 AFY;
- Local CVP M&I uses in SCVWD (up to 2,000 AFY) and/or SLWD (up to 5,000 AFY).[1]

The Proposed Action would develop up to 20,000 AFY of substitute water from a combination of groundwater pumping and conservation/rotational land fallowing. Based on the groundwater analysis (Appendix A), the Proposed Action would be a maximum groundwater pumping regime of 15,000 AF. The new groundwater pumping program would consist of up to 15 new wells (and 5 existing wells) using diesel-driven pumps. The groundwater would be pumped from the upper aquifer above a depth of 350 feet (above the Corcoran clay), blended with surface water deliveries in CCID canal to ensure adequate water quality for irrigation needs, and then used for irrigation within the CCID service area. The water developed from groundwater would be blended into the Outside Canal of CCID (Figure 2-4). The pumped groundwater would substitute for CVP surface water delivery from the Delta-Mendota Canal. The Exchange Contractors' proposed general schedule for the groundwater pumping in all water years is shown in Table 2.3-1 below. The temporal pattern of groundwater pumping could differ due to prevailing conditions.

[1] Only 2,000 AFY has 75 percent reliability of delivery to M&I users in the San Luis Water District, based on Reclamation's water needs assessment. Reliability is currently based on OCAP criteria (Reclamation 2004d) as appropriate. Furthermore, deliveries of water in excess of this amount (up to 3,000 AFY) for M&I purposes would need to be delayed until NEPA and Endangered Species Act (ESA) compliance is completed. ESA compliance includes completion of Biological Opinions (Section 7 consultations) and any additional Habitat Conservation Plans by other entities which are intended to address the impacts of urban development (Section 10 consultations). Water transferred to either SCVWD or SLWD would not be used for M&I purposes for specific developments until full ESA compliance is completed and any other NEPA issues not covered in this EA/IS are addressed. CEQA and California ESA compliance (CESA) may also be required for such transfers.

GROUNDWATER PUMPING AND WATER TRANSFER

Legend

- Proposed Well Field

Water Districts

- Broadview W.D.
- Central California I.D.
- Columbia Canal Co.
- Firebaugh Canal W.D.
- Grasslands W.D.
- Laguna W.D.
- Mercy Springs W.D.
- Oro Loma W.D.
- Panoche W.D.
- San Luis W.D.
- Westlands W.D.
- Widren W.D.

- Perennial Stream
- Intermittent Stream
- Water

0 0.5 1 2
Miles

FIGURE 2-4
PROPOSED WELL FIELD

ENTRIX

REFERENCE MAP

T:\GIS\ENTRIX\3132501_ExchangeContractors\map\EC_Figure3b_WellField_17i11i_02.mxd

Table 2.3-1 Proposed Action Groundwater Pumping

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Outside Canal													
Volume - TAF													
Wet	0.0	0.0	0.8	0.8	1.4	2.5	2.9	2.8	2.1	1.8	0.0	0.0	15.0
Above Normal	0.0	0.0	0.7	0.9	1.5	2.4	3.0	2.9	2.2	1.5	0.0	0.0	15.0
Below Normal	0.0	0.0	0.8	1.0	1.6	2.5	3.0	3.0	1.8	1.4	0.0	0.0	15.0
Dry	0.0	0.0	0.7	0.9	1.7	2.9	3.5	2.6	1.4	1.4	0.0	0.0	15.0
Critical	0.0	0.0	1.1	0.8	1.5	2.6	2.9	3.3	0.8	2.0	0.0	0.0	15.0
Flow - CFS													
Wet	0	0	12	14	22	42	48	45	35	29	0	0	
Above Normal	0	0	11	15	24	40	49	46	37	24	0	0	
Below Normal	0	0	12	16	26	42	49	49	30	23	0	0	
Dry	0	0	11	15	28	48	56	43	24	22	0	0	
Critical	0	0	17	14	24	44	48	54	14	32	0	0	
EC - uS/cm	3,200	3,200	3,200	3,200	3,200	3,200	3,200	3,200	3,200	3,200	3,200	3,200	

Source: Appendix D, Surface Water Resources Technical Report, Table 6

All 15 new wells are to be located in FCWD and the Camp 13 area of CCID where no wells are located at present. Figure 2-4, Proposed Well Field, illustrates the area where the new wells would be installed. This area was selected to maximize the benefits of reducing shallow groundwater levels and intercepting saline groundwater flows. Construction operations are assumed to impact the well location footprint and corridor, for an overall area of 400 square feet per well and 6,000 square feet total. The wells would be placed in areas previously disturbed by canal construction and agricultural activity. Pipes from the wellhead to the canal would be buried at a depth of no more than 2.5 feet. The pumped water would be blended with surface water in the Outside Canal and then used for irrigation within CCID.

The groundwater and surface water within the Camp 13 area of CCID and the FCWD is intensively monitored at present. The monitoring is primarily performed to manage discharge and/or reuse of tile drainage water developed within the area. The monitoring program would be expanded to:

- manage the pumping program relative to established groundwater management practices (AB 3030 Plan); and
- track and ensure that the water quality discharged into CCID canals is maintained within acceptable limits for the water users.

The Exchange Contractors' Proposed Action is to limit water transfers for M&I and irrigation purposes to existing uses only. There would be no new lands brought under production and no conversion of land to urban uses. Transfers that would result in CVP contract allocations greater than 100 percent of contract amounts for M&I and/or irrigation purposes would need to be shown to meet the following conditions:

- No new lands would be brought into agricultural production
- Agricultural or other undeveloped, non-urban land would not be converted to urban uses
- Use of transfer water would be shown by the purchaser to result in a reduction of groundwater or other source of supply.

See Section 2.4 (Phase 2 approval) for additional compliance requirements for potential deliveries to SLWD to serve the Villages development proposal.

The Proposed Action includes the development of water from conservation and/or rotational land fallowing. Conservation measures employed would be canal lining and drip irrigation techniques; no tailwater recovery would occur. Rotational land fallowing would be in addition to normal crop rotation practices.

This land fallowing would rotate the affected lands each year such that there would be no land fallowing in the next consecutive four years of the same acreage. Temporary land fallowing involves the cessation of agricultural equipment and operations for that land, except for soil management practices to minimize dust, erosion, and loss of topsoil. Fallowed land would be disked for weed control or planted with a cover crop, which is subsequently disked.

2.3.2 Alternative Action – Groundwater Pumping Only

This Alternative Action consists of developing up to 15,000 AF of groundwater pumping by CCID and FCWD, with the pumping potentially blended into the Outside Canal of CCID. The Alternative differs from the Proposed Action only in the quantity of water being developed (only 15,000 AFY) and the elimination of the conservation and rotational land-fallowing component. While being consistent with the basic objectives of the Proposed Action, this "Alternative Action – Groundwater Pumping Only" focuses on an amount of transfer water that is known to be currently in discussion with identified buyers.

The "Alternative Action – Groundwater Pumping Only" is technically feasible and an alternative representing conditions between those of the Proposed Action and Alternative Action without Groundwater Pumping (Section 2.3.3 below) which allow for a range of potential impacts to be evaluated.

2.3.3 Alternative Action without Groundwater Pumping

The Alternative Action without Groundwater Pumping would be to use alternative water development methods to generate 20,000 AF for transfer, i.e., no groundwater pumping, from a combination of conservation and fallowing measures. Conservation measures such as canal lining and drip irrigation (to reduce deep percolation) would be used to develop up to 15,000 AF. Temporary land fallowing could develop up to 15,000 AF (based on 2.75 AF/acre on 5,455 acres for the affected lands in CCID and FCWD). This land fallowing would rotate the affected lands each year such that there would be no land fallowing in the next consecutive four years of the same acreage. Temporary land fallowing involves the cessation of agricultural equipment and operations for that land, except for soil management practices to minimize dust, erosion, and loss of topsoil. Fallowed land would be disked for weed control or planted with a cover crop, which is subsequently disked.

The "Alternative Action without Groundwater Pumping" is technically feasible and is sufficiently different from the Proposed Action and the Alternative Action – Groundwater Pumping Only to allow for a full range of impacts to be evaluated.

2.4 Required Agency Approvals

Reclamation would need to review and approve each new transfer to ensure that the transfer meets State and Federal laws, including ESA compliance, and applicable policies and procedures governing transfer of CVP surface supplies. A two phased environmental compliance approach has been proposed anticipating that water deliveries could begin in 2008 for the Proposed Action or any Alternative Action.

Phase 1 would consist of environmental compliance on impacts of the water being delivered for existing agriculture and M&I uses[2] in San Luis, Westlands, Panoche, Pacheco and Santa Clara Valley Water Districts, for up to 20,000 AF delivered amongst the contractors. Reclamation could approve a 25-year water transfer to existing agriculture and M&I uses.

Any approval from Reclamation for deliveries of transfer water under this 25-year program to existing agriculture and M&I uses pursuant to Phase 1 will expressly preclude delivery of any such water to any new M&I development involving land conversion until all applicable NEPA and ESA requirements have been satisfied. This Phase 1 approval would not apply to the Villages project in San Luis Water District which could involve site-specific land conversion. Any land conversion will be evaluated separately under CEQA and NEPA.

Furthermore, in wet years (or other years) when CVP water allocations to any of the purchasing water districts are 100 percent of their total contract amounts, it is possible that these districts' water demands could result in a need to purchase transfer water from the Exchange Contractors that would cause them to exceed their total existing contract supply. The proposed transfer could occur under any of the following circumstances:

- No new lands would be brought into agricultural production
- Agricultural or other undeveloped, non-urban land would not be converted to urban uses
- Use of transfer water would be shown by the purchaser to result in a reduction of groundwater or other source of supply.

For any deliveries to new M&I uses in excess of existing contract amounts, **Phase 2** would consist of consultation with the U.S. Fish and Wildlife Service (Service or USFWS) on impacts and mitigation for conversion of 3,000 AF (of the proposed 20,000 AF) to serve new proposed development ("Villages") within the San Luis Water District currently under discussion. In consideration of the Villages development schedule, it is anticipated that the Villages development will not call on the 3,000 AF until 2009 at the earliest, allowing Reclamation and the Service time to complete the Phase 2 environmental compliance including any San Joaquin kit fox mitigation requirements.

The new diesel pumps for the wells would require a permit from the San Joaquin Valley Air Pollution Control District (SJVAPCD), specifically obtaining an Authority to Construct (ATC).

[2] Existing uses here are water applications to lands that are either currently in agricultural production (including lands temporarily fallowed) or presently developed for commercial, residential, or industrial uses.

2.5 Mitigation Measures and Monitoring

Mitigation measures are defined as specific feasible actions to avoid, minimize, rectify, reduce or eliminate, or compensate for any potentially adverse impacts from any part of the Proposed Action. Although not a mitigation measure under CEQA, monitoring ensures that the conclusions regarding no impacts continue over the life of the project.

To develop a reasonable range of alternatives and to identify the Proposed Action, an analysis of effects to **groundwater resources** was conducted initially with a broad range of assumptions. This analysis showed that the Proposed Action would enhance the quality of the downgradient groundwater in the upper aquifer. Pumpage of 20,000 AFY in this area would control most of the northeasterly flow of poor quality groundwater, so pumping of 15,000 AFY would control much of the flow. There are no significant adverse impacts, as the poor quality groundwater inflow (quantity) into Madera County is undesirable. No mitigation is required. Additional monitoring has been incorporated into the Proposed Action (Section 2.3.1) to ensure that this level of pumping is sustainable over the 25-year period of the Proposed Action.

For **surface water resources**, the analysis in Section 4.4.2.2 indicates that the Proposed Action would not significantly affect water quantity or quality in the San Joaquin River. No mitigation is required.

Directly attributed to the Proposed Action pumping of 15,000 AF would be a reduction in tile drainage discharge due to a lowering of groundwater in the area, a beneficial effect. This direct reduction in drainage flow is estimated to approach 135 AFY. The Westside Drainage Program involves extensive water quality monitoring. Other monitoring by the Exchange Contractors includes long-term monitoring under the Water Transfer Policy Relating to Drainage Projects (September 2004). Consequently, no additional monitoring of surface water outflows is needed.

The resource analyses contained in Section 4 of this EA/IS indicate that the following measures are incorporated into the Proposed Action to mitigate potential adverse effects.

- **Cultural Resources:** To avoid potentially significant impacts to unidentified cultural resources from installation of wells, the best mitigation is avoidance. To locate cultural resources to be avoided, a survey of the well sites would be conducted and reported to the State Historic Preservation Office (SHPO). A visual survey of each well site would be conducted to see if any cultural material were present. If any cultural resources were located during the survey of the well sites, those well sites would be relocated and the new location surveyed. There is potential for sites to be buried deeply with no visible surface material. The one previously recorded archaeological site within the well development area contained burials located seven feet below the surface. Even if no resources are identified during the survey, well installation workers would be trained to identify cultural materials if required by SHPO. If any cultural material was encountered during the digging of any of the wells, work would stop and the site would be evaluated by a qualified archaeologist.

Additional measures to reduce less-than-significant impacts even further include the following:

- **Air Quality for Well Construction:** No significant construction-related impacts are associated with the Proposed Action, and no mitigation is required. However, the SJVAPCD strongly encourages the implementation of mitigation measures (as listed in Table 4.1-1) to minimize any construction impacts from PM_{10} and fugitive dust emissions. Measures to avoid and/or minimize even insignificant impacts to air quality are included as part of the Proposed Action design and standard construction and operation protocols. The most likely measures are the use of water or chemical stabilizer/suppressant**.**
- **Air Quality for Well Operation:** The Proposed Action would use diesel engines that meet Best Available Control Technology (BACT) requirements, so there would be no significant impact. The new engines would be required to meet BACT requirements as outlined in SJVAPCD Rule 4702. As mentioned previously, the BACT standard for NO_X requires a 96.6 percent reduction from Tier 2 and a 94.3 percent reduction from Tier 3, which can only be accomplished by selective catalytic reduction (SCR) for diesel engines. SCR would be implemented on the engines as BACT mitigation.

For **biological resources**, there are no significant impacts from water development, and no mitigation is required. However, standard kit fox avoidance measures (including preconstruction surveys) will be implemented for well construction. A qualified biologist will inspect each well site prior to the initiation of construction activities. Water recipients in the San Luis Unit of the CVP are subject to the Phase 2 conditions explained in Section 2.4. Phase 2 was intended to address the Villages in SLWD and not the San Felipe Division contractors such as SCVWD.

Furthermore, the Exchange Contractors have implemented the following criteria for water transfers related to **drainage management** to avoid potential environmental and third party impacts (September 2004):

- The amounts of water made subject to transfer will not reduce the amounts of water or the schedule of water deliveries available to other member units under the Exchange Contract;
- The transfer water being made available shall be conditioned upon the maintenance and implementation of long-term monitoring and adjustment factors which will further drainage management objectives.

These mitigation measures are hereby incorporated into the Proposed Action or to the other Action Alternatives where applicable, and there are no significant unavoidable impacts.

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3.0 AFFECTED ENVIRONMENT/ ENVIRONMENTAL SETTING

This section discusses the affected environment/environmental setting for each of the environmental resources that could be potentially affected by the three Action Alternatives' water development activities: air, biology, cultural, hydrology, land use, and socioeconomics. The environmental setting for the water development area is described first, followed by a discussion of the water receiving areas. This introduction to Section 3 also presents the water transfer policies of Reclamation Exchange Contractors.

The areas in the San Luis Unit and Santa Clara Valley Water District that could receive the transferred water are described in the following NEPA documents which are referenced in this EA/IS document: *San Luis Unit, Draft Environmental Impact Statement, Long-Term Contract Renewal* (San Luis Unit DEIS) (Reclamation 2005c), and *Long-Term Renewal of the Contract Among the United States and the Pajaro Valley Water Management Agency, Westlands Water District Distribution District No. 1, and Santa Clara Valley Water District Providing for Central Valley Water Service (Contract No. 14-06-200-3365A)* (Reclamation 2004b). Appendices A through E of the San Luis Unit DEIS also provide descriptions of the environmental setting, and key sections are summarized herein.

The affected environment for one of the receiving areas, the San Luis Unit, is based on Chapter 3 of the San Luis Unit DEIS (Reclamation 2005c). The service contractors of the San Luis Unit that could receive water from the proposed water transfer include the Pacheco Water District, Panoche Water District, San Luis Water District, and Westlands Water District for agricultural water, and the San Luis Water District for M&I water. Soils and geology (Section 3.7), visual resources (Section 3.13), and public health (Section 3.14) are all discussed in the San Luis Unit DEIS (Reclamation 2005c). These resource sections are not summarized here because they are not the resources focused on in this EA/IS. Furthermore, drainage is summarized in Section 3.2 of the San Luis Unit DEIS where the affected environment focuses on the San Joaquin River because drainage from the Northern San Luis Unit reaches the San Joaquin River in the form of drainage flows discharged to Mud Slough North and the river by the Grassland Bypass Project. There is presently no outlet for drainage discharges from the Westlands area of the San Luis Unit. Flows into the San Joaquin River play a major role in establishing its water quality.

An additional source of information for the environmental setting includes the *Final EIS/EIR, Water Transfer Program for the San Joaquin River Exchange Contractors Water Authority 2005-2014,* Bureau of Reclamation and San Joaquin River Exchange Contractors Water Authority, December 2004 (Reclamation 2004a).

The environmental settings for other resources are not discussed in this EA/IS, because no adverse effects were foreseen from any of the components of the Action Alternatives. These resources and their "no significant effects" are documented in Section 4.8 of this EA/IS.

Any proposed water transfer will need to comply with Reclamation's Central Valley Project Improvement Act of 1992 (CVPIA) and the Exchange Contractors' water transfer policies provided below.

CVPIA Water Transfers

Section 3405, Water Transfers, Improved Water Management and Conservation, is provided below.

(a) Water Transfers.--In order to assist California urban areas, agricultural water users, and others in meeting their future water needs, subject to the conditions and requirements of this subsection, all individuals or districts who receive Central Valley Project water under water service or repayment contracts, water rights settlement contracts or exchange contracts entered into prior to or after the date of enactment of this title are authorized to transfer all or a portion of the water subject to such contract to any other California water user or water agency, State or Federal agency, Indian Tribe, or private non-profit organization for project purposes or any purpose recognized as beneficial under applicable State law. Except as provided herein, the terms of such transfers shall be set by mutual agreement between the transferee and the transferor.

(1) Conditions for Transfers.--All transfers to Central Valley Project water authorized by this subsection shall be subject to review and approval by the Secretary under the conditions specified in this subsection. Transfers involving more than 20 percent of the Central Valley Project water subject to long-term contract within any contracting district or agency shall also be subject to review and approval by such district or agency under the conditions specified in this subsection:

(A) No transfer to combination of transfers authorized by this subsection shall exceed, in any year, the average annual quantity of water under contract actually delivered to the contracting district or agency during the last three years of normal water delivery prior to the date of enactment of this title.

(B) All water under the contract which is transferred under authority of this subsection to any district or agency which is not a Central Valley Project contractor at the time of enactment of this title shall, if used for irrigation purposes, be repaid at the greater of the full-cost or cost of service rates, or, if the water is used for municipal and industrial purposes, at the greater of the cost of service or municipal and industrial rates.

(C) No transfers authorized by this subsection shall be approved unless the transfer is between a willing buyer and a willing seller under such terms and conditions as may be mutually agreed upon.

(E) All transfers authorized by this subsection shall be deemed a beneficial use of water by the transferor for the purposes of section 8 of the Act of June 17, 1902, 32 Stat. 390, 43 U.S.C. 372.

(G) No transfer authorized by this subsection shall be considered by the Secretary as conferring supplemental or additional benefits on Central Valley Project water contractors as provided in section 203 of Public Law 97-293 (43 U.S.C. 390(cc)).

(H) The Secretary shall not approve a transfer authorized by this subsection unless the Secretary has determined, consistent with paragraph 3405(a)(2) of this title, that the transfer will not violate the provisions of this title or other Federal law and will have no significant adverse effect on the Secretary's ability to deliver water pursuant to the

Secretary's Central Valley Project contractual obligations or fish and wildlife obligations under this title because of limitations in conveyance or pumping capacity.

(I) The water subject to any transfer undertaken pursuant to this subsection shall be limited to water that would have been consumptively used or irretrievably lost to beneficial use during the year or years of the transfer.

(L) The Secretary shall not approve a transfer if the Secretary determines, consistent with paragraph 3405(a)(2) of this title, that such transfer would result in a significant reduction in the quantity or decrease in the quality of water supplies currently used for fish and wildlife purposes, unless the Secretary determines pursuant to finding setting forth the basis for such determination that such adverse effects would be more than offset by the benefits of the proposed transfer. In the event of such a determination, the Secretary shall develop and implement alternative measures and mitigation activities as integral and concurrent elements of any such transfer to provide fish and wildlife benefits substantially equivalent to those lost as a consequence of such transfer.

(M) Transfers between Central Valley Project contractors within countries [sic], watersheds, or other areas of origin, as those terms are utilized under California law, shall be deemed to meet the conditions set forth in subparagraphs (A) and (I) of this paragraph.

(2) Review and Approval of Transfers.--All transfers subject to review and approval under this subsection shall be reviewed and approved in a manner consistent with the following:

(A) Decisions on water transfers subject to review by a contracting district or agency or by the Secretary shall be rendered within ninety days of receiving a written transfer proposal from the transferee or transferor. Such written proposal should provide all information reasonably necessary to determine whether the transfer complies with the terms and conditions of this subsection.

(B) All transfers subject to review by a contracting district or agency shall be reviewed in a public process similar to that provided for in section 226 of Pub. L. 97-293.

(C) The contracting district or agency or the Secretary shall approve all transfers subject to review and approval by such entity if such transfers are consistent with the terms and conditions of this subsection. To disapprove a transfer, the contracting district or agency or the Secretary shall inform the transferee and transferor, in writing, why the transfer does not comply with the terms and conditions of this subsection and what alternatives, if any, could be included so that the transfer would reasonably comply with the requirements of this subsection.

(D) If the contracting district or agency or the Secretary fails to approve or disapprove a proposed transfer within ninety days of receiving a complete written proposal from the transferee or transferor, then the transfer shall be deemed approved.

(3) Transfers executed after September 30, 1999 shall only be governed by the provisions of subparagraphs 3405(a) (1) (A)-(C), (E), (G), (H), (I), (L), and (M) of this title, and by State law.

Exchange Contractors' Water Transfer Policies

The Exchange Contractors and its four members have each adopted water transfer policies. Water transfers must adhere to and be consistent with these policies. The water transfer policies for CCID, FCWD, and the Exchange Contractors that are applicable to the Proposed Action are summarized in Table 3-1. These water transfer policies are summarized because these directly concern the districts that would develop the water for transfer.

Table 3-1. Water Transfer Policy Summary

Water District	Policies
CCID Adopted October 27, 1993 Revised July 13, 1995	Before a transfer is considered, the transferor will demonstrate that: • The transfer does not unreasonably impact: a) The quantity and quality of surface water supply available to CCID and its water users; b) The quantity and quality of groundwater within CCID and the Exchange Contractors' service area, or interrelated surface streams or other groundwater supplies within CCID and Exchange Contractors' service area; c) CCID's operations, including, but not limited to the ability of the CCID to meet its delivery obligations, obtain additional water supplies, and undertake conservation measures, exchanges, transfers, groundwater storage, or conjunctive use programs; d) The CCID's financial condition and its cost of providing water service to its water users; e) The appropriate maintenance of fallowed land; f) The ability of CCID or its water users to provide drainage to land including the ability to meet regulatory requirements relating to discharge of agricultural drainage; and g) Other relevant factors that may create an adverse financial, operations, or water supply impact on the CCID or its water users. • The Transferor is responsible for payment of all costs and fees associated with developing and processing a complete written water transfer proposal, in advance of CCID's staff review. • The Transferor is responsible for payment of all necessary mitigation costs associated with the transfer including groundwater safe yield studies, monitoring studies, groundwater recharge studies, and any subsidence impact monitoring studies. • The Transferor is responsible for payment of water transfer conservation fees. • CCID requires a written contract if a written water transfer proposal is accepted. • Only 20% of CCID's estimated on-farm use or that quantity of water which CCID determines can be safely transferred will be approved. • Groundwater substitute pumping or fallowing will be specified in a landowner-CCID contract and groundwater amounts used by lands initiating the transfer cannot exceed the annual fair share of safe yield, etc.

Table 3-1. Water Transfer Policy Summary

Water District	Policies
	• Compliance with statutorily adopted best water management and urban water management plans, including no dependence on the transferred water and a drainage program is adopted that is not deleterious to downslope lands. • Compliance with CEQA and NEPA requirements and subject to a public hearing.
FCWD Adopted March 11, 1993	FCWD Directors must approve of all water transfers which: • Do not involve more than 20% of FCWD's water supply subject to contract with Reclamation. • No transfer of more than 20% of FCWD's water supply subject to contract with Reclamation shall be approved without FCWD approval or conditioned approval. • No water transfer will be approved if a substitution of groundwater is likely to result in significant long-term adverse impacts on groundwater conditions within the FCWD's service area, or in unreasonable interference with pumping rates or capacities of wells within the FCWD's service area. • No water transfer will be approved that involves groundwater pumping in critical water years. • Before FCWD approval, the transferee must conduct a water conservation program in compliance with the urban water management plan and Water Code Sections 10610, et seq., and 10656 or an agricultural management plan adopted pursuant to Water Code Sections 10800 et seq., and a drainage program must be approved which will not cause a deleterious affect on lands downslope of any irrigated lands impacted by the transfer. • Public hearings may be held to determine compliance with CEQA, impacts of the proposed transfer on water supply, operations, and financial conditions of FCWD and its water users.
Exchange Contractors' Water Transfer Policy Relating to Drainage Projects, Adopted September 3, 2004	6.2 Drainage Plan Transfers. Water transfer proposals which provide for funding for drainage projects from the Firebaugh Canal Water District service area and from the Camp 13 service area portion of the Central California Irrigation District and which comply with all of the following criteria are hereinafter referred to as "Drainage Plan Transfers." 6.2.1 A Drainage Plan Transfer is one in which all of the following requirements are met: A. The transfer is of water conserved or developed within the service areas described as an integral part of a plan to reduce drainage, manage drainage and improve drainage water quality, which transfer is based upon findings made and adopted by the respective member entity that the transfer will reduce drainage discharges and contribute to compliance with water quality regulatory requirements; and, B. The transfer is found by the respective member entity to be required because of a failure of the United States Department of Interior, Bureau of Reclamation to provide for the construction and operation of a drainage system as required by Section 1A of the San Luis Act irrigated lands and as provided under Section 5 of the San Luis Act and for adjoining lands impacted by irrigation of San Luis Unit lands; and,

Table 3-1. Water Transfer Policy Summary

Water District	Policies
	C. The net proceeds of the transfer will be utilized for the purposes of implementing the Drainage Plan and reducing the physical and monetary impacts to landowners and water users within the described areas of the Member Units service area from drainage and water quality impacts; and, D. The amounts of water made subject to transfer will not reduce the amounts of water or the schedule of water deliveries available to other member units under the Exchange Contract; E. The amounts of water to be transferred are shown by a water budget first prepared and approved by the member unit and then approved by the Exchange Contractors to be not in excess of the amounts of water made available as a means of reducing drainage impacts within the Exchange Contractor service areas. The water budget shall be prepared utilizing established scientific methods and shall demonstrate that the transfer will allow continued agricultural use of water within the Firebaugh Canal Water District and/or the Camp 13 area of Central California Irrigation District on a long-term basis in accordance with the Drainage Plan; and, F. The transfer shall be conditioned upon the maintenance and implementation of long-term monitoring and adjustment factors which will further the Drainage Plan; and, G. The initial consideration of the transfer pursuant to the Drainage Plan shall occur prior to conduct of CEQA/NEPA processes and final approval shall occur only after completion of all regulatory and environmental processes. Final approval shall be granted only if, in the judgment of the SJRECWA, the approval of the transfer and its term will further the goals of the SJRECWA in preserving the rights to water of the Exchange Contractors and providing a long-term means of reducing damages from drainage impacts and the regulatory conditions placed upon drainage flows. 6.2.2 A Drainage Plan Transfer shall be proposed only by an Exchange Contractor Member Entity.

Sources: Fresno County/Exchange Contractors MOU 2001; Exchange Contractors 2004; CCID 1995; FCWD 1993.

3.1 Air Resources

3.1.1 Environmental Setting

3.1.1.1 Water Development Area

The environmental setting is summarized from the Air Quality Technical Report, Appendix B, for the water development area. Topography and climate affect the level of regional air quality. The relatively long and narrow San Joaquin Valley allows almost no escape for air pollution. The setting of the San Joaquin Valley, coupled with high summer temperatures and inversions that create additional natural barriers to pollution dispersion, creates difficulties in meeting state and Federal air quality standards. In addition, rapid population growth, the presence of two major interstate highways, and a diversity of urban and rural sources have a strong negative impact on regional air quality. With more stringent

air quality management regulations, emission levels in the San Joaquin Valley have been decreasing over the past 15 years except for emissions of particulate matter of less than 10 microns in diameter (PM_{10}). Based on the information presented in California Air Resources Board's (ARB) 2002 California Almanac of Emissions and Air Quality (available at http:/www.arb.ca.gov/aqd/aqd.htm), it appears that the downward trend in emission levels is expected to continue. These decreases are predominately due to motor vehicle controls and reductions in evaporative and fugitive emissions (Reclamation 2004a).

Air quality in the San Joaquin Valley is not dominated by emissions from one large urban area. Instead, a number of moderately sized urban areas are located throughout the valley. On-road vehicles are the largest contributor to carbon monoxide emissions as well as a large contributor to nitrogen oxide emissions. A large portion of the stationary source reactive organic carbon gas emissions is fugitive emissions from oil and gas production operations. PM_{10} emissions primarily result from paved and unpaved roads, agricultural operations, and waste burning. Engines used in agriculture, both mobile and stationary, also contribute to the San Joaquin Valley's air pollution problem (Reclamation 2004a).

The water development activity of the Proposed Action lies entirely within the 8-county San Joaquin Valley Air Basin (SJVAB), which includes San Joaquin, Stanislaus, Merced, Madera, Fresno, Kings, Tulare, and western Kern counties. The SJVAB incorporates the same area as the jurisdiction of the San Joaquin Valley Air Pollution Control District (SJVAPCD), encompassing approximately 25,000 square miles. The Proposed Action is located within the San Joaquin Valley Intrastate Air Quality Control Region (AQCR). The Regions were established by the Clean Air Act (CAA) as a method of dividing the country into regional air basins based on air pollution being a regional problem and not limited to political or state boundaries.

3.1.1.2 Water Receiving Areas

Most of the air pollutants in the area of the San Luis Unit are associated with both urban and agricultural land uses. Land uses in the San Luis Unit fall into four general categories: irrigated agriculture; dryland agriculture (dry-cropped, fallow, idle, or grazed); urban and industrial; and undeveloped (natural). The primary air pollutants associated with these four general land uses include PM and hydrocarbons or organic gases that may serve as O_3 precursors. (Reclamation 2005c)

Pollutants commonly associated with agricultural land uses include PM, CO, NO_X, and O_3 precursors. Particulate matter results from field burning; farm operations such as tilling, plowing, and the operation of farm equipment on loose earth; and entrained road dust released by and fuel combustion in vehicles and farm equipment. Particulate emissions may also occur when fallow fields do not have a crop cover to inhibit wind erosion. Carbon monoxide is released to the atmosphere during field burning and by fuel combustion in farm equipment. Nitrogen oxides are also released during field burning. Ozone precursors are released in farm equipment emissions and during the application of pesticides and fertilizers. The effect of these practices on air quality conditions may be influenced by meteorological conditions, the variability of emissions controls, and the adoption and enforcement of emissions regulations. (Reclamation 2005c)

Many urban and industrial practices result in hydrocarbon and PM emissions. Sources of hydrocarbon emissions include fuel combustion in vehicles and industrial equipment, painting and solvent use, and residential heating. Sources of PM emissions include dust entrained in pavement, structural and automobile fires, construction and demolition, residential fuel combustion, and fuel consumption in vehicles. (Reclamation 2005c)

In undeveloped areas, hydrocarbon emissions result primarily from wildfires, and particulate emissions result from windblown dust and wildfires. No clear relationship exists between agricultural acres and the occurrence of O_3 and PM in the atmosphere. Several variables other than land use can affect air quality conditions, and these variables may change over time. (Reclamation 2005c)

Santa Clara Valley Water District encompasses Santa Clara County, covering 1,312 square miles in the San Francisco Bay Area. It is located within the San Francisco Bay Area Air Quality Management District.

3.1.2 Regulatory Setting

The 1970 Clean Air Act (amended in 1977 and 1990) authorizes the U.S. Environmental Protection Agency (USEPA) to promulgate air quality standards for the six (6) criteria air pollutants: ozone (O_3), carbon monoxide (CO), lead (Pb), nitrogen dioxide (NO_2), particulates 10 microns (μm) or less (PM_{10}) and particle size of 2.5 μm or less ($PM_{2.5}$), and sulfur dioxide (SO_2). These standards include primary standards designed to protect public health and secondary standards to protect public welfare, predominately visibility. These National Ambient Air Quality Standards (NAAQS) reflect the relationship between pollutant concentrations and health and welfare effects. California established its own set of ambient air quality standards (CAAQS) for the criteria pollutants, which are more stringent than the NAAQS.

The health effects associated with each pollutant are shown on Table 3.1-1. This table also summarizes the State and Federal primary and secondary standards for the six pollutants and the averaging time for determining compliance with the standards.

Regional air basins are designated as either in attainment of the NAAQS or as nonattainment for violating the NAAQS. States or AQCRs that are in nonattainment must require control equipment on their stationary sources in order to reduce criteria pollutants.

On April 28, 2005, ARB passed new, stricter standards for ozone. The newly approved standards include:

- A new 8-hour-average standard for ozone at 0.070 ppm, not to be exceeded;
- Retention of the current ozone 1-hour-average standard at 0.09 ppm, not to be exceeded; and
- Retention of the current monitoring method for ozone, which uses the ultraviolet (UV) photometry method, for compliance with the CAAQS for ozone.

Following approval by ARB's Executive Officer, the standards will be adopted and the Final Statement of Reasons (FSOR) will be completed. ARB anticipates that the adopted standards will go into effect by January 2006.

Table 3.1-1. Summary of Federal and California Ambient Air Quality Standards and Attainment Status for the SJVAB

Air Pollutant	State Standard Concentration/ Averaging Time	San Joaquin Valley Air Basin Attainment Status – State	Federal Primary Standard Concentration/ Averaging Time	San Joaquin Valley Air Basin Attainment Status – Federal	Most Relevant Effects
Ozone (O_3)	0.070 ppm (137 µg/m^3) 8-hr avg.	This standard was approved by the ARB on April 28, 2005 and is expected to become effective in early 2006.	0.08 ppm (157 µg/m^3) 8-hr avg.**	Nonattainment/ Serious	(a) Short-term exposures: (1) Pulmonary function decrements and localized lung edema in humans and animals (2) Risk to public health implied by alterations in pulmonary morphology and host defense in animals;
	0.090 ppm (180 µg/m^3) 1-hr. avg.	Nonattainment/ Severe	None	The Federal 1-hour O_3 standard was revoked by U.S. EPA on June 15, 2005.	(b) Long-term exposures: Risk to public health implied by altered connective tissue metabolism and altered pulmonary morphology in animals after long-term exposures and pulmonary function decrements in chronically exposed humans; (c) Vegetation damage; (d) Property damage
Carbon Monoxide (CO) [portion including Tulare County]	9.000 ppm (10 mg/m^3) 8-hr avg.	Unclassified/ Attainment	9 ppm (10 mg/m^3) 8-hr avg.	Attainment	(a) Aggravation of angina pectoris and other aspects of coronary heart disease; (b) Decreased exercise tolerance in persons with peripheral vascular disease and lung disease; (c) Impairment of central nervous system functions; (d) Possible increased risk to fetuses
	20.000 ppm (23 mg/m^3) 1-hr avg.	Unclassified/ Attainment	35 ppm (40 mg/m^3) 1-hr avg.		

Table 3.1-1. Summary of Federal and California Ambient Air Quality Standards and Attainment Status for the SJVAB

Air Pollutant	State Standard Concentration/ Averaging Time	San Joaquin Valley Air Basin Attainment Status – State	Federal Primary Standard Concentration/ Averaging Time	San Joaquin Valley Air Basin Attainment Status – Federal	Most Relevant Effects
Nitrogen Dioxide ($N0_2$)	0.25 ppm (470µg/m^3) 1-hr avg.	Attainment	0.053 ppm, annual arithmetic mean (100 µg/m^3)	Unclassified/ Attainment	(a) Potential to aggravate chronic respiratory disease and respiratory symptoms in sensitive groups; (b) Risk to public health implied by pulmonary and extra-pulmonary biochemical and cellular changes and pulmonary structural changes; (c) Contribution to atmospheric discoloration
Sulfur Dioxide ($S0_2$)	0.04 ppm, (105µg/m^3) 24-hr avg.	Attainment	0.030 ppm, annual arithmetic mean (80 µg/m^3)	Unclassified	(a) Bronchoconstriction accompanied by symptoms which may include wheezing, shortness of breath and chest tightness, during exercise or physical activity in persons with asthma
	0.25 ppm, (655µg/m^3) 1-hr avg.	Attainment	0.14 ppm (365 µg/m^3) 24-hr avg.	Unclassified	
Suspended Particulate Matter (PM_{10})	20 µg/m^3, annual geometric mean	Nonattainment – In June 2002, ARB established new annual standards for $PM_{2.5}$ and PM_{10}.	50 µg/m^3, annual arithmetic mean 150 µg/m^3 24-hr avg.	Nonattainment Nonattainment/ Serious	(a) Excess deaths from short-term exposures and exacerbation of symptoms in sensitive patients with respiratory disease; (b) Excess seasonal declines in pulmonary function, especially in children
	50 µg/m^3 24-hr avg.	Nonattainment	15 µg/m^3, annual arithmetic mean		
Particulate Matter ($PM_{2.5}$)	12 µg/m^3, annual arithmetic mean	Nonattainment – In June 2002, ARB established new annual standards for $PM_{2.5}$ and PM_{10}.	65 µg/m^3 24-hr avg.	Nonattainment Nonattainment	

Table 3.1-1. Summary of Federal and California Ambient Air Quality Standards and Attainment Status for the SJVAB

Air Pollutant	State Standard Concentration/ Averaging Time	San Joaquin Valley Air Basin Attainment Status – State	Federal Primary Standard Concentration/ Averaging Time	San Joaquin Valley Air Basin Attainment Status – Federal	Most Relevant Effects
Sulfates	25 µg/m^3 24-hr avg.	Unclassified	None	NA	(a) Decrease in ventilatory function; (b) Aggravation of asthmatic symptoms; (c) Aggravation of cardio-pulmonary disease; (d) Vegetation damage; (e) Degradation of visibility; (f) Property damage
Lead (Pb)	1.5 µg/m^3 30-day avg.	Attainment	1.5 µg/m^3 calendar quarter	No designation	(a) Increased body burden; (b) Impairment of blood formation and nerve conduction
Hydrogen Sulfide (H_2S)	0.03 ppm (42 µg/m^3)	Attainment	None	NA	Severe irritant to eyes and mucous membranes
Visibility-Reducing Particles	Insufficient amount to reduce the visual range to less than 10 miles at relative humidity less than 70%, 8-hr avg (10am – 6pm)	Attainment	None	NA	Visibility impairment on days when relative humidity is less than 70 percent

Source: San Joaquin Valley Air Pollution Control District, Ambient Air Quality Standards & Valley Attainment Status, http://www.valleyair.org/aqinfo/attainment.htm

**The national 1-hour ozone standard was revoked by U.S. EPA on June 15, 2005.

µg/m3 = microgram per cubic meter
ppm = parts per million
Parenthetical value is an approximately equivalent concentration.

On June 15, 2005, USEPA revoked the 1-hour ozone standard for all areas except the 8-hour ozone nonattainment Early Action Compact Areas (EAC) as published in 40 CFR 50.9(b).

Both NAAQS and CAAQS are listed here, and discussed in detail in Appendix B.

3.1.2.1 Federal

The CAA of 1970, 42 USC 7401 et seq. as amended in 1977 and 1990, is the basic Federal statute governing air quality. The provisions of the CAA that are potentially relevant to the Proposed Action are:

- Air Quality Control Regions (AQCR)
- National Ambient Air Quality Standards
  - Ozone Nonattainment Area Classification
  - Ozone (O_3)

    The SJVAB is currently designated as serious nonattainment for the Federal 8-hour ozone standard.
  - Nitrogen Dioxide (NO_2)
  - Carbon Monoxide (CO)
  - Sulfur Dioxide (SO_2)
  - Particulate Matter (PM)

    The SJVAB is designated as serious nonattainment for the Federal PM_{10} standard, and is considered in nonattainment with the Federal $PM_{2.5}$ standard.
  - Lead (Pb)

3.1.2.2 State

The California Air Resources Board (ARB) was created by the Mulford-Carrell Air Resources Act in 1968. ARB's primary responsibilities include: (1) develop, adopt, implement, and enforce the State's motor vehicle pollution control program; (2) administer and coordinate the State's air pollution research program; (3) adopt and update the State's ambient air quality standards; (4) review the operations of the local air pollution control districts; and (5) review and coordinate the State Implementation Plans (SIPs) for achieving Federal ambient air quality standards.

- State Implementation Plan
- California Clean Air Act
  - Particulate Sulfates
  - Other State-Designated Criteria Pollutants

3.1.2.3 Local

State law establishes local air pollution control districts (APCDs) and air quality management districts (AQMDs) with the responsibility for regulating emissions from stationary sources. Thus, the SJVAPCD would be the primary regulating agency for the Proposed Action and Alternative Action – Groundwater Pumping Only water development activities. The SJVAPCD enforces rules and regulations associated with air quality emissions. The following rules apply to the two Action Alternatives:

- Rule 2010, Permits Required
- Rule 2040, Applications
- Rule 2070, Standards for Granting Applications
- Rule 2201, New and Modified Stationary Source Review
- Rule 2520, Federally Mandated Operating Permits
- Rule 2530, Federally Enforceable Potential to Emit
- Rule 4701, Internal Combustion Engines – Phase 1
- Rule 4702, Internal Combustion Engines – Phase 2

  This Rule 4702 implements new EPA Tiered emission standards for stationary IC engines, both spark ignition (gas) and compression ignition (diesel). Emergency engines are exempt, subject to enforceable operating hour limits. Engines used on mobile agricultural equipment are exempt. However, stationary agricultural engines are no longer exempt under the new rule and are subject to NSR.

  Subpart 5.1.2 (Table 2 in Rule 4702) sets emission standards for non-certified and certified engines with compliance dates. For a project constructed in calendar year 2006, the rule requires either:

  – A Tier 2 engine to be replaced with a Tier 4 engine before January 1, 2015, or 12 years after installation, whichever is later; or

  – A Tier 3 or Tier 4 engine (no future replacement required).

  Calendar year 2006 is the last sales year for Tier 2 engines in the 75 to 130 KW (100 to 175 BHP) range; Tier 3 takes effect in 2007. Therefore, for the Proposed Action, Tier 2 engines could be installed in 2006 and replaced with Tier 4 engines in 2018. However, since project engines would operate a maximum of 3000 hrs/yr, Tier 3 engines may be economically preferable since no future replacement will be required, and the proposed contract ends in 2031.

  Per SJVAPCD (see NSR), Best Available Control Technology (BACT) is independent of Tiered standards implemented by the rule. As shown in the following table, BACT is more stringent than the rule and supersedes the Tiered standards for NO_X and PM_{10}.

Table 3.1-2. USEPA Tier 2 and 3 Standards (75-130 KW, 100-175 BHP)

Emittent	Tier 2 g/kw-hr	Tier 3 g/kw-hr	BACT g/kw-hr	BACT g/bhp-hr
NO_X	5.80	3.50	0.20	0.15
VOC	0.80	0.50	0.50	0.37
CO	5.00	5.00	5.00	3.73
PM_{10} (Tier complies with ATCM)	0.30	0.30	0.30	0.22

Notes:
Tier 2 NO_X + VOC = 6.6 g/KW-hr in combination, Tier 3 NO_X + VOC = 4.0 g/KW-hr in combination

In addition to NO_X BACT of 0.15 g/BHP-hr, ARB's Air Toxics Control Measure (ATCM) rule for diesel particulate matter (DPM, as PM_{10}) requires 0.22 g/BHP-hr for agricultural engines in the 100 to 175 BHP range. Tier 2 and 3 engines conform to this standard. (Nonagricultural engines must meet 0.01 g/BHP-hr under the ATCM rule through the use of add-on particle traps.)

The BACT standard for NO_X requires a 96.6 percent reduction from Tier 2 and a 94.3 percent reduction from Tier 3. This can only be accomplished by add-on exhaust controls, i.e., selective catalytic reduction (SCR) for diesels. While nonselective catalytic reduction (NSCR) can be used for spark ignition (gas) engines, the precise lambda (free oxygen) control is problematic for compression ignition applications with only about 80 to 85 percent reduction of NO_X. SCR uses vaporized 19 percent aqueous ammonia (ammonium hydroxide, NH_4OH) as a reducing agent for NO and NO_2 to form nitrogen gas and water vapor:

$$4\ NO + 4NH_3 + O_2 \rightarrow 4\ N_2 + 6\ H_2O$$

$$2\ NO_2 + 4\ NH_3 + O_2 \rightarrow 3\ N_2 + 6\ H_2O$$

Therefore, in addition to 180 gallons/day diesel fuel, 19 percent aqua ammonia must be supplied to each engine. To reduce 20 lbs/day NO from a Tier 3 engine, about 9 lb/day ammonia is required, or 47 pounds/day (6 gallons/day) of a 19 percent solution for a 150 BHP engine. Estimated emissions for a single and multiple units are shown in Tables 3.1-3, 3.1-4, and 3.1-5.

Table 3.1-3. Estimated Emissions for Single 150 BHP BACT Engine (3,000 hrs/yr)

Emittent Name	Tier 3 BACT		
	ton/yr	lb/hr	lb/day
Nitrogen Oxides (as NO_2)	0.07	0.05	1.2
Reactive Hydrocarbons (ROC) as CH_4	0.18	0.12	3.0
Carbon Monoxide (CO)	1.85	1.23	29.6
Sulfur Dioxide (SO_2)	0.00	0.00	0.0
Particulates (as PM_{10})	0.11	0.07	1.8
Carbon Dioxide (CO_2)	258.93	172.62	4,143.0

Table 3.1-4. Estimated Emissions for Fifteen 150 BHP BACT Engines (3,000 hrs/yr)

Emittent Name	Tier 3 BACT		
	ton/yr	lb/hr	lb/day
Nitrogen Oxides (as NO_2)	1.11	0.74	17.8
Reactive Hydrocarbons (ROC) as CH_4	2.77	1.85	44.4
Carbon Monoxide (CO)	27.74	18.50	443.9
Sulfur Dioxide (SO_2)	0.04	0.02	0.6
Particulates (as PM_{10})	1.66	1.11	26.6
Carbon Dioxide (CO_2)	3884.00	2589.34	62,144.0

Table 3.1-5. Estimated Emissions for Twenty 150 BHP BACT Engines (3,000 hrs/yr)

Emittent Name	Tier 3 BACT		
	ton/yr	lb/hr	lb/day
Nitrogen Oxides (as NO_2)	1.4	1.0	24
Reactive Hydrocarbons (ROC) as CH_4	3.6	2.4	60
Carbon Monoxide (CO)	37	24.6	592
Sulfur Dioxide (SO_2)	0.064	0.03	0.8
Particulates (as PM_{10})	2.2	1.4	36
Carbon Dioxide (CO_2)	5,178.6	3,452.4	82,860

Pursuant to Rule 2201, since BACT emissions would be below offset thresholds, offsets would not be required. If sites are noncontiguous, CO emissions would be below the 100 lb/day public notice threshold for each permitted unit.

3.2 Biological Resources

3.2.1 Environmental Setting

3.2.1.1 Water Development Area

Undeveloped lands on the valley floor are now restricted to small habitat patches that are fragmented and isolated from each other. The fish community in the water development area is dominated by introduced species. Habitats found in the water development area include riparian communities, rangelands, and agricultural habitat. The adjacent Volta Wildlife Area includes wetlands and alkali sink areas.

Land Use, Vegetation Communities, and Wildlife Habitat within the Water Development Area

The well field area consists of intensively farmed croplands and graded and maintained farm roads. Drainage canals may support some vegetation, including patches of cattails. However,

these canals are subject to regular vegetation maintenance activities and do not develop extensive freshwater marsh habitat. The proposed water transfer utilizes pumped groundwater for use on CCID agricultural lands, and transfers Delta-Mendota Canal water to the receiving areas.

Canals in the Action Alternatives area may support a warm-water fishery, including bass, crappie, catfish, and sunfish (EPA 2006, Reclamation 2005c). The intermittent streams within the Action Alternatives area are not known to support anadromous fish and are unlikely to support populations of resident fish. Hydrologic conditions in these streams are characterized by low flows, increased temperatures, and reduced water quality.

The site of the Proposed Action well field provides limited wildlife habitat due to intensive cultivation of the fields and maintenance of the farm roads and the canals and drains. Adjacent land use includes similar fields and an urban area.

Pastures can provide habitat roosting and foraging habitat for shorebirds, as well as nesting habitat for ground-nesting birds. Pastures can provide forage for seed-eating birds and small mammals. Raptors, including red-tailed hawks (*Buteo jamaicensis*) and white-tailed kites (*Elanus leucurus*), may prey on available small mammals.

Limited fringes of riparian habitat consisting primarily of willow (*Salix* spp.) thickets with occasional cottonwoods (*Populus* spp.) are present in some areas of the CCID (Alternative Action), such as along the bank edge of seasonal Orestimba Creek. Riparian vegetation provides foraging, roosting, and nesting habitat for a variety of species, including raptors and songbirds. The riparian habitat in the area is narrow, which reduces the quality it provides. These areas are not expected to be affected by the Action Alternatives.

Managed marshes are present in the Volta Wildlife Area adjacent to some CCID lands. The marshes and alkali sink areas in the Volta Wildlife Area provide habitat for a variety of bird species, including waterfowl, shorebirds, and wading birds. This area may also provide habitat for the giant garter snake (*Thamnophis gigas*). This area is not expected to be affected by the Proposed Action.

Special-Status Species

Seventy-three special-status species are potentially present in the vicinity of the water development area. However, no special-status species are expected to occur, other than as transitory migrants, in the areas affected by any of the Action Alternatives. A list of these special-status species and an evaluation of their potential to occur is provided in Appendix C. The table in Appendix C also includes special-status species potentially present in the water receiving areas.

Although no Federally listed species are expected to occur in the water development area, a brief description of those potentially present in the vicinity or with critical habitat in the vicinity is provided below.

A list of Federally listed, proposed and candidate species and proposed or designated critical habitat with the potential to occur in the action area was obtained from the USFWS (http://www.fws.gov/sacramento/es/spp_list.htm) on June 19, 2007 (Document Number 070619032337), and is provided as Appendix C, Attachment C-2.

The vicinity of the Proposed Action, including the San Joaquin River and its tributaries, potentially provides habitat for one Federally listed plant species and nineteen Federally listed wildlife species, including fish. Habitat for two candidate species for Federal listing may also be present. These species are discussed in more detail in the following sections.

These species include ten that are Federally listed as endangered: palmate-bracted bird's-beak (*Cordylanthus palmatus*), Conservancy fairy shrimp (*Branchinecta conservatio*), longhorn fairy shrimp (*Branchinecta longiantenna*), vernal pool tadpole shrimp (*Lepidurus packardi*), Sacramento River winter-run chinook salmon (*Oncorhynchus tshawytscha*), blunt-nosed leopard lizard (*Gambelia silus*), least Bell's vireo (*Vireo bellii pusillus*), giant kangaroo rat (*Dipodomys ingens*), Fresno kangaroo rat (*Dipodomys nitratoides exilis*), and San Joaquin kit fox (*Vulpes macrotis mutica*).

Eleven species that are Federally listed as threatened could potentially occur or have critical habitat in the vicinity of the proposed action. These species include: Hoover's spurge (*chamaesyce hooveri*) vernal pool fairy shrimp (*Branchinecta lynchi*), valley elderberry longhorn beetle (*Desmocerus californicus dimorphus*), delta smelt (*Hypomesus transpacificus*), Central Valley steelhead (*Oncorhynchus mykiss*), Central Valley spring-run chinook salmon (*Oncorhynchus tshawytscha*), green sturgeon (*Acipenser medirostris*), California tiger salamander (*Ambystoma californiense*), California red-legged frog (*Rana aurora draytonii*), giant garter snake (*Thamnophis gigas*), and bald eagle (*Haliaeetus leucocephalus*).

No proposed or designated critical habitat occurs in the water development areas.

The only habitat types that are in the well development areas are agricultural. As explained further below, these lands do not provide much if any habitat for special-status species. Agricultural development, with its associated changes in vegetation structure from the historic state, its frequent ground disturbance, irrigation, pesticide use, and loss of microtopographic relief from laser leveling, ahs already eliminated most of these species from the area.

As a result of the fact that the construction of wells in water development areas would occur on agricultural lands that are not in close proximity to natural lands, no Federally listed species are expected to occur in these areas. One Federally endangered species, the San Joaquin kit fox, can have some limited use of agricultural lands. Orchards are more easily utilized than most other crop types (Cypher 2006, Warrick et al. submitted). Kit foxes may use the outer edges of these lands for foraging, when they neighbor more suitable habitat, although the disturbance from activities associated with agriculture appears to preclude denning (Warrick et al. *submitted*). The nature of the well development areas, which are not planted with orchards and do not neighbor more suitable habitat, would not fall under the description of agricultural lands that would be expected to be used by kit foxes.

Only two other special-status species may have some use of agricultural lands. One is the Swainson's hawk, listed as threatened under CESA and protected by the Migratory Bird Treaty Act. Swainson's hawks require large, open grasslands with abundant prey in association with suitable nest trees. Suitable foraging areas include native grasslands or lightly grazed pastures, alfalfa and other hay crops, and certain grain and row croplands. The majority of Swainson's hawk territories in the Central Valley are in riparian systems adjacent

to suitable foraging habitats. Swainson's hawks often nest in proximity to riparian systems as well as utilizing lone trees or groves of trees in agricultural fields. The water development areas lack trees that could provide nest sites and also don't provide suitable foraging habitat. Finally, the western burrowing owl (protected by the Migratory Bird Treaty Act and also a species of special concern) can use grasslands and pastures, which provide the short vegetation structure that the species requires. California ground squirrel burrows are very important; burrowing owls don't construct their own burrows. The water development areas on which wells may be constructed, lack these habitat components.

Plants

Hoover's Spurge

Hoover's spurge (*Chamaesyce hooveri*), is Federally listed as threatened (*Federal Register* 1997) and is a CNPS List 1B species (CNPS 2001). This species is included in the *Recovery Plan for Vernal Pool Ecosystems of California and Southern Oregon* (USFWS 2005e).

Description and Distribution: Hoover's spurge is an annual plant that flowers from July to August (CNPS 2001). This species is found in valley and foothill grassland and vernal pools at elevations from 80 to 427 feet (CDFG 2006a). This spurge is restricted to vernal pools, but utilizes soils ranging from clay to sandy loam (USFWS 2005d). The historical range for this species was reported as Tehama, Tulare, Butte, Merced, and Stanislaus Counties (USFWS 2005d), and it is currently reported from Tehama, Tulare, Butte, Merced, and Stanislaus, and Glenn Counties (USFWS 2005d).

Occurrence in Project Area: Hoover's spurge has not been reported within the immediate vicinity of the water development or water delivery areas (CDFG 2006a), but critical habitat for this species is present near the water development area (USFWS 2005d).

Critical Habitat: Critical habitat has been designated for Hoover's spurge (*Federal Register* 2003, 2006). Unit 6 of this critical habitat is approximately five miles from the water development area.

Palmate-Bracted Bird's-Beak

The palmate-bracted bird's-beak (*Cordylanthus palmatus*), is Federally and state-listed as endangered (*Federal Register* 1986, CDFG 2006d) and is a CNPS List 1B species (CNPS 2001). This species is included in the *Recovery Plan for Upland Species in the San Joaquin Valley* (USFWS 1998a).

Description and Distribution: Palmate-bracted bird's-beak is an annual plant that flowers from May to October (CNPS 2001). This species is found in chenopod scrub and in valley and foothill grassland at elevations from 15 to 510 feet (CDFG 2006a). This bird's-beak is restricted to seasonally flooded, alkaline soils (USFWS 1998a). The historical range for this species was reported as Colusa, Yolo, Alameda, San Joaquin, Madera, and Fresno Counties (CNPS 2001), but it is currently reported from Glenn, Colusa, Yolo, Alameda, and Fresno Counties (CDFG 2006a).

Occurrence in Project Area: Occurrences of the palmate-bracted bird's-beak have been reported within approximately five miles of the action area in the Mendota Wildlife Management Area (CDFG 2006a), but no habitat for this species is present in the water development area (USFWS 1998a).

Critical Habitat: No critical habitat has been designated for palmate-bracted bird's-beak.

Invertebrates

Conservancy Fairy Shrimp

The conservancy fairy shrimp (*Branchinecta conservatio*) is Federally listed as endangered (*Federal Register* 1994a). This species is included in the *Recovery Plan for Vernal Pool Ecosystems of California and Southern Oregon* (USFWS 2005d).

Description and Distribution: This species is known from several disjunct populations in the Central Valley of California, from Tehama County to northern Ventura County. The conservancy fairy shrimp inhabits large vernal pools with highly turbid water. This species has been observed from November to early April.

Occurrence in Project Area: Occurrences of the conservancy fairy shrimp have been reported within approximately five miles of the action area in the slough area lying between CCID lands and the San Joaquin River (CDFG 2006a), but no habitat for this species is present in the water development area

Critical Habitat: Critical habitat has been designated for the conservancy fairy shrimp, but no critical habitat occurs within the water development area (*Federal Register* 2003, 2005a).

Longhorn Fairy Shrimp

The longhorn fairy shrimp (*Branchinecta longiantenna*) is Federally listed as endangered (*Federal Register* 1994a). This species is included in the *Recovery Plan for Vernal Pool Ecosystems of California and Southern Oregon* (USFWS 2005d).

Description and Distribution: This species in known from disjunct populations from eastern Contra Costa County to eastern San Luis Obispo County, including Kesterson National Wildlife Refuge in the Central Valley. The longhorn fairy shrimp inhabits clear to turbid grass-bottomed vernal pools in grasslands and clear-water pools in sandstone depressions. All vernal pools inhabited by this species are filled by winter and spring rains and may remain inundated until June. Adults of this species have been observed from late December until late April (*Federal Register* 1994a).

Occurrence in Project Area: Occurrences of the longhorn fairy shrimp have been reported within one mile of the action area in the slough areas lying between CCID lands and the San Joaquin River (CDFG 2006a), but no habitat for this species is present in the water development area.

Critical Habitat: Critical habitat has been designated for the longhorn fairy shrimp, but no critical habitat occurs within the water development area (*Federal Register* 2003, 2005a).

Vernal Pool Tadpole Shrimp

The vernal pool tadpole shrimp (*Lepidurus packardi*) is Federally listed as endangered (*Federal Register* 1994a). This species is included in the *Recovery Plan for Vernal Pool Ecosystems of California and Southern Oregon* (USFWS 2005d).

Description and Distribution: This species is known from several populations in the Central Valley, extending Shasta County south through the Central Valley to the San Luis National Wildlife Refuge in Merced County. This fairy shrimp also occurs in a vernal pool complex located on the San Francisco Bay National Wildlife Refuge in Alameda County.

The vernal pool tadpole shrimp inhabits vernal pools containing clear to highly turbid water, commonly in grass bottomed swales of grasslands in old alluvial soils underlain by hardpan or in mud-bottomed pools containing highly turbid water. Sexually mature adults have been observed in pools from three to seven weeks after inundation occurred. The vernal pool tadpole shrimp matures slowly and is a long-lived species. Observations indicate that a female surviving to large size may lay up to six clutches of eggs in her lifetime. A portion of the eggs hatch immediately and the rest enter diapause and remain in the soil to hatch during later rainy seasons. Adults are often present and reproductive until the pools dry up in the spring (*Federal Register* 1994a).

Occurrence in Project Area: Occurrences of the vernal pool tadpole shrimp have been reported within five miles of the action area in the slough areas lying between CCID lands and the San Joaquin River (CDFG 2006a), but no habitat for this species is present in the water development area.

Critical Habitat: Critical habitat has been designated for the vernal pool tadpole shrimp, but no critical habitat occurs within the water development area (*Federal Register* 2003, 2005a).

Vernal Pool Fairy Shrimp

The vernal pool fairy shrimp (*Branchinecta lynchi*) is Federally listed as threatened (*Federal Register* 1994a). This species is included in the *Recovery Plan for Vernal Pool Ecosystems of California and Southern Oregon* (USFWS 2005d).

Description and Distribution: This fairy shrimp is a small crustacean in the Branchinectidae family that occupies a variety of different vernal pool habitats most commonly found in grass or mud bottomed swales, or basalt flow depression pools in unplowed grasslands of Oregon and California. Vernal pool fairy shrimp are sometimes found in natural or artificially created ephemeral habitats such as alkali pools, seasonal drainages, stock ponds, vernal swales, and rock outcrops (Vollmar 2002). These pools and swales fill with rainwater and remain inundated until spring or early summer. During the wet season, the cysts of the crustaceans will hatch,

producing the next generation of adult crustaceans. Average time to maturity is only forty-one days. In warmer pools, it can be as little as eighteen (Eriksen and Belk 1999). The adults reach sexual maturity rapidly, and mating during the wet season results in the production of cysts (eggs). The cysts float to the bottom sediments, where they remain throughout the dry season. These cysts are drought resistant and can persist in this dormant state for extended periods of time (up to ten years).

The primary dispersal method for these animals likely was winter and spring flooding events, which allowed them to colonize different vernal pools and other inundated areas. Due to changes in the California landscape, it is believed that these crustaceans are currently dispersed by waterfowl; the cysts/eggs are ingested or adhere to the legs and feathers of waterfowl, and these birds transport the crustaceans to new vernal pool complexes.

This species' distribution extends from Stillwater Plain in Shasta County through most of the length of the Central Valley to Pixley in Tulare County to Pinnacles in San Benito County. Four additional disjunct populations exist: one near Soda Lake in San Luis Obispo County, one in the mountain grasslands of northern Santa Barbara County, one near the Santa Rosa Plateau in Riverside County, and one near Rancho California in Riverside County.

Occurrence in Project Area: Occurrences of the vernal pool fairy shrimp have been reported within five miles of the action area in the slough areas lying between CCID lands and the San Joaquin River (CDFG 2006a), but no habitat for this species is present in the water development area.

Critical Habitat: Critical habitat was listed for the vernal pool fairy shrimp on August 6, 2003 (*Federal Register* 2003, 2005a). Thirty-five critical habitat units were designated, including 29 units in California. The water development area is not located within a critical habitat area.

Valley Elderberry Longhorn Beetle

The valley elderberry longhorn beetle (*Desmocerus californicus dimorphus*) is Federally listed as threatened (*Federal Register* 1980).

Description and Distribution: This beetle is associated with various species of elderberry (*Sambucus* spp.). This species occurs in the Sacramento and San Joaquin Valleys and surrounding foothills. The range of the valley elderberry longhorn beetle extends from Shasta to Kern County from the valley floor to approximately the 3,000-foot contour in the foothills to the east and the watershed of the Central Valley on the west (USFWS 1996c). The valley elderberry longhorn beetle generally occurs along waterways and in floodplains that support remnant stands of riparian vegetation. Both larvae and adult beetles feed on elderberry: larvae feed internally on the pith of the trunk and larger branches for one to two years, while adult beetles appear to feed externally on elderberry flowers and foliage (*Federal Register* 1980). Prior to metamorphosing into the adult life stage, valley elderberry longhorn beetle larvae chew an exit hole in the elderberry trunk, through which the adult beetle later exits the plant. They feed on leaves and flowers before mating and beginning the cycle

over again. Exit holes are usually found in stems greater than about one inch in diameter and less than two feet above ground level.

Occurrence in Project Area: No habitat for the valley elderberry longhorn beetle is present in the water development area.

Critical Habitat: Critical habitat was listed for the valley elderberry longhorn beetle on August 8, 1980 (*Federal Register* 1980) and is limited to two areas in Sacramento County. The water development area contains no critical habitat area for this species.

Fish

Steelhead Trout

Steelhead trout (*Oncorhynchus mykiss*) is one of the principal anadromous salmonids in the Sacramento-San Joaquin river and delta system. Steelhead trout (steelhead) in the action area are part of the Central Valley Distinct Population Segment (DPS). This DPS is Federally listed as threatened (*Federal Register* 2006a).

Description and Distribution: Both steelhead and chinook live in the ocean and migrate to their natal streams to spawn. Steelhead, unlike chinook salmon (below), do not die after spawning, but return to the ocean and spawn in later years. Adult females excavate nests (redds) and lay their eggs in coarse gravels in the riffles. Water passes through the gravel aerating the eggs and newly hatched fry (alevins). Survival of developing eggs is dependent on streamflow, gravel quality, and silt load. After the yolk sac is absorbed, fry emerge from the gravels to rear. Rearing steelhead remain in the stream until they are one to three years old then migrate downstream to the ocean. When juveniles enter the estuarine environment, they undergo a physiological change called smoltification where they become adapted to the marine environment. After one to two years in the ocean, steelhead return again to natal streams to spawn. The adult diet consists primarily of fish. While in freshwater, juveniles are opportunistic drift feeders, which take a wide variety of terrestrial and aquatic insects and some crustaceans.

Occurrence in Water Development Area: There are no recorded CNDDB occurrences of steelhead trout within a 10-mile radius of the water development area (CDFG 2006a). No habitat for this species is present in the water development area.

Critical Habitat: Critical habitat has been designated for steelhead (*Federal Register* 2006a), but the water development area does not include a critical habitat area.

Winter-Run Chinook Salmon

The winter-run chinook salmon (*Oncorhynchus tshawytscha*) is Federally and state listed as endangered (*Federal Register* 1989, CDFG 2006b).

Description and Distribution: Sacramento winter-run chinook salmon historically migrated up the Sacramento River to spawn the upper reaches of the Sacramento River, the McCloud River and the lower Pit River (Moyle et al. 1989). No spawning occurred in small tributary streams. Presently, winter-run chinook salmon spawning is

limited to the Sacramento River 43.5 miles immediately downstream of Kenswick Dam (Moyle 2002). Winter-run chinook salmon require cold (10 to 15ºC), clear, spring-fed streams during the summer for incubation and fry to survive (Moyle 2002). Neither the water development area, nor the Cow Creek Watershed are part of the present or past range for winter-run chinook salmon (*Federal Register* 1997).

Occurrence in Project Area: There are no recorded CNDDB occurrences of chinook salmon within a 10-mile radius of the water development area (CDFG 2006a). No habitat for this species is present in the water development area.

Critical Habitat: Critical habitat has been designated for winter-run chinook salmon (*Federal Register* 1990a), but the water development area does not include a critical habitat area.

Spring-Run Chinook Salmon

The spring-run chinook salmon (*Oncorhynchus tshawytscha*) is Federally and state listed as threatened (*Federal Register* 1999b, CDFG 2006b).

Description and Distribution: Spring-run chinook salmon are primarily found in four tributaries to the Sacramento River, Butte, Big Chico, Deer, and Mill Creeks. These fish enter the Sacramento River between February and June. They move upstream and enter tributary streams from February through July. Spring-run chinook ascend into the headwaters and hold in pools until they spawn, starting as early as mid-August and ending in mid-October. Emergence of juvenile fish starts in early November and continues through the following April. These juveniles emigrate from the tributaries as fry from mid-November through June. However, some fish remain in the stream until the following October and emigrate as "yearlings," usually with the onset of storms starting in October through the following March (CDFG 2006c).

Occurrence in Project Area: Spring-run chinook used the upper reaches of the San Joaquin River historically, but have not done so since the completion of Friant Dam in 1949. There are no recorded CNDDB occurrences of chinook salmon within a 10-mile radius of the area of the water development area (CDFG 2006a). No habitat for this species is present in the water development area.

Critical Habitat: Critical habitat has been designated for spring-run chinook salmon (*Federal Register* 2005c), but the water development area does not include a critical habitat area.

Delta Smelt

Delta smelt (*Hypomesus transpacificus*) is Federally and state-listed as threatened (*Federal Register* 1993a, CDFG 2006b). A recovery plan for this species was produced in 1996 (USFWS 1996b)

Description and Distribution: This smelt typically moves seasonally between open surface waters of the Delta to channels and sloughs of the Delta, apparently for spawning. Delta smelt is the only smelt endemic to California, and it is the only native estuarine species found in the Delta (Stevens et al. 1990, Wang 1986). Delta

smelt also are present in the Sacramento, San Joaquin, and Mokelumne rivers, beyond the legal boundary of the Delta (*Federal Register* 1994b). For a large part of its annual life span, this euryhaline species (tolerant of wide salinity range) forms large schools on the highly productive freshwater edge of the saltwater-freshwater mixing zone. Shortly before spawning, adults disperse upstream to shallow, fresh or brackish water river channels and backwater sloughs where they spawn. Spawning commonly occurs in February and March, but can last from December to April. Most spawners apparently die after spawning. The eggs probably attach to nearshore cattails and tules, tree roots, and submerged branches. After hatching, larvae are transported downstream toward the mixing zone, where they are retained in the vertical fresh and salt water circulation. This shallow-water mixing zone supports high phytoplankton and zooplankton densities on which larvae and juveniles rapidly grow. The Delta smelt zooplankton diet primarily consists of copepods, although cladocerans, amphipods, and insect larvae are also consumed. In the fall, opossum shrimp (*Neomysis* spp.) also become an important food source.

Occurrence in Project Area: There are no recorded CNDDB occurrences of delta smelt within a 10-mile radius of the area of the water development area (CDFG 2006a). No habitat for this species is present in the water development area.

Critical Habitat: Critical habitat has been designated for the delta smelt (*Federal Register* 1994b), but the water development area is not located within a critical habitat area.

Green Sturgeon

The green sturgeon (*Acipenser medirostris*) is Federally proposed for listing as threatened and is state listed as threatened (*Federal Register* 2006b, CDFG 2006b).

Description and Distribution: This sturgeon is commonly found in brackish water. Its range extends from Baja California to the Bering Sea and Japan. The green sturgeon is anadromous, spending its adult life in the ocean but spawning in coastal streams. This fish ascends to its spawning areas in winter, but does not spawn until the following summer. The preferred spawning substrate for green sturgeon is large cobble, but it can range from clean sand to bedrock (CDFG 2006a).In California, this species spawns in the Klamath River and in the Sacramento River as far as Red Bluff Diversion Dam (RM 243) (Moyle 2002). The principal spawning area for the Sacramento River may be the lower Feather River (Moyle 2002).

Occurrence in Project Area: There are no recorded CNDDB occurrences of green sturgeon within a 10-mile radius of the water development area (CDFG 2006a). No habitat for this species is present in the water development area.

Critical Habitat: No critical habitat has been proposed for the green sturgeon. Potential criteria for critical habitat are under evaluation (*Federal Register* 2006b).

Amphibians

California Tiger Salamander

The California tiger salamander (CTS) (*Ambystoma californiense*) was Federally listed as threatened on September 3, 2004 (*Federal Register* 2004). The California tiger salamander is also a California species of special concern (CDFG 2006b).

Description and Distribution: The historical range of the California tiger salamander (CTS) includes the Central Valley from Colusa County south to Tulare or Kern County and coastal valleys from Sonoma County south to Santa Barbara County (Shaffer et al. 1993). The CTS has very strict habitat requirements that must be met for it to complete its life cycle. Historically, it bred in playa pools and other temporary ponds (Shaffer et al. 1993), although intermittent streams may have occasionally been used (Zeiner et al. 1988). Today, many of the known populations breed in stock ponds associated with cattle operations, but populations also utilize remaining playa pools in the Central Valley and coastal valleys (*Federal Register* 2004).

The CTS occurs in grasslands and open oak woodland that provide suitable upland refugial habitat (i.e., summer retreats) and/or breeding habitats. CTS spend the majority of their lives underground in California ground squirrel (*Spermophilus beechyi*) burrows, Botta's pocket gopher (*Thomomys bottae*) burrows, and other subterranean refugia. The CTS emerges from its upland refugial sites for only a few nights each year during the rainy season to migrate to its breeding ponds. Seasonal playa pools or fishless artificial impoundments such as stock ponds provide suitable breeding habitat. Eggs hatch within a few weeks and the larvae develop over a period of weeks and typically transform to become juveniles in late spring or early summer. Larvae feed on aquatic invertebrates. Juveniles usually migrate to rodent burrows and, like the adults, sometimes emerge on suitable nights to feed. Individuals, or the entire population, may forego reproduction for one or more years if conditions are not suitable, such as years of low rainfall (Shaffer et al. 1993, Jennings and Hayes 1994). Adult and juvenile individuals of the species feed mainly on terrestrial invertebrates.

Since the CTS may migrate as much as 0.62-mile from its underground retreats to breeding ponds, unobstructed migration corridors are critical to this animal's survival (Brode 1997). Breeding ponds and streams also need to hold water at least until the month of May to allow time for larvae to fully metamorphose.

Occurrence in Project Area: There are no recorded CNDDB occurrences of California tiger salamander within a 10-mile radius of the water development area (CDFG 2006a). No habitat for this species is present in the water development area.

Critical Habitat: A critical habitat determination was published for the California tiger salamander on September 22, 2005 (*Federal Register* 2005b), but no critical habitat is present in the water development area.

California Red-Legged Frog

The California red-legged frog (CRLF) (*Rana aurora draytonii = Rana draytonii*) was Federally listed as a threatened species on May 20, 1996 (CDFG 2006b). The CRLF is also a California species of special concern (CDFG 2006b). The California red-legged frog (*Rana aurora draytonii*) was previously considered to be one of two subspecies of the red-legged frog (*Rana aurora*) found on the Pacific coast. Northern Sonoma County represents the approximate dividing line between *R. a. aurora*, the northern subspecies, and *R. a. draytonii*, the subspecies that was Federally listed. A recovery plan for this species was completed in 2002 (USFWS 2002), but no core units are in the vicinity of the water development area.

Description and Distribution: Historically, the CRLF occurred in coastal mountains from Sonoma County south to northern Baja California, and along the foothills of the Central Valley from about Shasta County south to Kern County (Jennings and Hayes 1994). Currently, this species generally only occurs in the coastal portions of its historic range; it is apparently extinct in most of southern California south of Ventura County.

CRLF are generally confined to aquatic habitats, such as streams, ponds and hillside seeps that maintain pool environments or saturated soils throughout the summer months. This frog typically occurs in areas of low-velocity streamflow having pools two to three feet deep with adjacent dense emergent or riparian vegetation (Jennings and Hayes 1988). Adult frogs move seasonally between their egg-laying sites and foraging habitat, but generally rarely move large distances from their aquatic habitat. Riparian habitat containing willows (*Salix* spp.) and emergent vegetation such as cattails (*Typha* spp.) are preferred red-legged frog habitats, though not necessary for this species to be present. CRLF populations may be reduced in size in some ponds with non-native predators such as bullfrogs (*Rana catesbeiana*), centrarchid fish species (such as green sunfish (*Lepomis cyanellus),* or black bass *(Micropterus* sp.), and signal and red swamp crayfish (*Pacifastacus leniusculus* and *Procambarus clarkii*, respectively).

CRLF breed from November to April, depending on locality. Egg masses averaging 500-2000 ova are attached to submersed vegetation (Jennings and Hayes 1994). Eggs hatch within six to fourteen days, and metamorphosis generally occurs between June and September. Adult CRLF include invertebrates, tadpoles, other small frogs and even small mammals in their diets. Significant predators include common garter snakes (*Thamnophis sirtalis*) and (possibly) wading birds. Exotic predators such as centrarchid fish and bullfrogs are suspected but unproven significant predators of CRLF.

Occurrence in Project Area: A CRLF occurrence has been reported within two miles to the west of the Alternative 2 portion of the water development area (CDFG 2006a). No habitat for this species is present in the water development area.

Critical Habitat: Critical habitat was designated for the CRLF on March 13, 2001, including 31 critical habitat units (*Federal Register* 2001). Critical habitat was remanded and partially vacated by DC District court effective November 6, 2002. A

revision of the boundaries of the critical habitat areas was designated on April 13, 2006 (*Federal Register* 2006c). The water development area is not located within a critical habitat area.

Reptiles

Blunt-Nosed Leopard Lizard

The blunt-nosed leopard lizard (*Gambelia sila*) is Federally and state-listed as endangered (CDFG 2006b). This species is included in the *Recovery Plan for Upland Species in the San Joaquin Valley* (USFWS 1998a).

Description and Distribution: This lizard is found in sparsely vegetated alkali and desert scrub habitats. The blunt-nosed leopard lizard currently occurs at scattered sites in the San Joaquin Valley and adjacent foothills on alkali flats, large washes, arroyos, canyons, and low foothills from elevations of 100 to 3,000 feet (Zeiner et al. 1988). Suitable habitat for this species is characterized by sparsely vegetated scrub and grassland habitats in areas of low topographic relief. In areas of high relief, distribution is usually confined to broad sandy washes. The blunt-nosed leopard lizard emerges from hibernation in March or April and by late June or July, this species again retreats underground to escape the summer heat. Blunt-nosed leopard lizards mate from late April through May. Females usually lay eggs between May and June. At this latter time only subadult and hatchling individuals generally continue to be active. By August or September all adults have retreated to burrows to begin over-wintering. Hatchlings may be active until mid-October or November, depending on weather conditions (USFWS 1998b). Females normally produce one clutch per year, although occasionally a second is produced. The incubation period is about 57 days. This species is active mornings and afternoons, and preys on lizards, and large insects. Individuals use small rodent burrows for shelter from predators and temperature extremes. The burrows are usually abandoned ground squirrel tunnels, or occupied or abandoned kangaroo rat tunnels (Montanucci 1965).

Occurrence in Project Area: There are recorded CNDDB occurrences of blunt-nosed leopard lizard within eight miles of the water development area (CDFG 2006a). However, no habitat for this species is present in the area of the water development area.

Critical Habitat: No critical habitat is designated or proposed for the blunt-nosed leopard lizard.

Giant Garter Snake

The giant garter snake (*Thamnophis gigas*), state and Federally listed as threatened (CDFG 2006b), is the largest member of the garter snake family, reaching lengths of over five feet. A draft recovery plan for this species was completed in 1999 (USFWS 1999).

Description and Distribution: Endemic to the Central Valley, this semi-aquatic snake occurs along sloughs, ponds, low gradient streams, and irrigation/drainage

canals with open basking sites and uplands for winter hibernation retreats (Steinhart 1990). Giant garter snakes are typically active between April and October. However, recent data indicate that they may remain active late into fall (USGS Western Ecological Research 1999). Most giant garter snakes are in winter retreats (hibernaculae) above the ordinary high water line by November, where they remain until the following spring. The snake feeds primarily on small fish, frogs, and tadpoles.

Occurrence in Project Area: Although several surveys for giant garter snakes have been conducted in the last fifteen years (Martin and Christophel 1992, Dickert 2005), giant garter snakes have not been recorded in south San Joaquin Valley since the 1970's and are probably extirpated from there. The last known nearby record near the water development area was in 1976 at Mendota Dam, 1.5 miles north of Mendota (CDFG 2006a).

Habitat requirements for giant garter snake are described by USFWS as follows:

> Giant garter snakes feed primarily on small fishes, tadpoles, and frogs. Habitat requirements consist of (1) adequate water during the snake's active season (early-spring through mid-fall) to provide food and cover; (2) emergent, herbaceous wetland vegetation, such as cattails and bulrushes, for escape cover and foraging habitat during the active season; (3) grassy banks and openings in waterside vegetation for basking; and (4) higher elevation uplands for cover and refuge from flood waters during the snake's dormant season in the winter.

Although some prey items may be present in the canal water, the project area does not offer appropriate habitat for giant garter snake (USFWS 2006). The canal sides and levees are continuously maintained and kept free of vegetation. A minor amount of emergent vegetation grows in the canals but it is meager and inadequate for basking and cover. Upland areas near the canals are not appropriate for cover and refuge as they are highly managed to prevent vegetation or encroachment by burrowing creatures. Surrounding agricultural lands are also managed and are clean of native vegetation.

The likelihood is extremely low that giant garter snakes can subsist in the water development area and they are not expected to occur there. However, this species does occur in wildlife areas in the vicinity of the Proposed Action.

Critical Habitat: No critical habitat has been designated or proposed for the giant garter snake.

Birds

Least Bell's Vireo

The least Bell's vireo (*Vireo bellii pusillus*) is Federally and state listed as endangered (*Federal Register* 1986; CDFG 2006b). A draft recovery plan has been completed for this species (USFWS 1998b).

Description and Distribution: Habitat requirements for the least Bell's vireo consists of dense riparian willow thickets with well-developed and understories, and low densities of aquatic and herbaceous cover, in the immediate vicinity of watercourses. The understory typically contains dense shrub thickets, consisting of willow or mule fat. Foraging habitat includes both the riparian nesting habitat and adjacent chaparral. The least Bell's vireo arrives in its breeding habitat in mid-March to early April. Although this vireo nests primarily in willows, it also uses a variety of other shrubs, trees, and vines. Clutch size is usually four eggs and incubation usually lasts about 14 days. The least Bell's vireo leaves its breeding grounds in late August and September for its wintering range in Mexico (*Federal Register* 1986).

Occurrence in Project Area: Although breeding pairs of the least Bell's vireo had long been absent from the Central Valley, a breeding pair was observed in the San Joaquin Wildlife Refuge in Stanislaus County in the summer of 2005 (Caine 2005). There are no recorded CNDDB occurrences of least Bell's vireo within a 10-mile radius of the action area (CDFG 2006a). Suitable habitat for this species may be present in willow thickets along creeks such as Orestimba Creek within the Exchange Contractors area. This habitat is adjacent to fields that may be fallowed, but is not directly subject to such actions. No habitat for least Bell's vireo is present in the water development area.

Critical Habitat: Critical habitat has been designated for the least Bell's vireo. The water development area is not located within a critical habitat area (*Federal Register* 1994c).

Bald Eagle

The bald eagle (*Haliaeetus leucocephalus*) Federally listed as threatened and state-listed as endangered (CDFG 2006b). A recovery plan for the Pacific states population of the bald eagle was completed in 1986 (USFWS 1986). This species was proposed for delisting as recovered in 1999 (*Federal Register* 1999a).

Description and Distribution: is a permanent resident in California. It is now restricted to breeding mostly in Butte, Lake, Lassen, Modoc, Plumas, Shasta, Siskiyou, and Trinity counties. About half of the wintering population is in the Klamath Basin. The bald eagle is fairly common as a local winter migrant at a few favored inland waters in southern California. The largest numbers of eagles occur at Big Bear Lake, Cachuma Lake, Lake Matthews, Nacimiento Reservoir, San Antonio Reservoir, and along the Colorado River. This species is typically found in coniferous forest habitats with large, old growth trees near permanent water sources such as lakes, rivers, or ocean shorelines. It requires large bodies of water with abundant fish and adjacent snags or other perches for foraging. The bald eagle preys mainly on fish and occasionally on small mammals or birds, by swooping from a perch or from mid-flight. Nests are found in large, old growth, or dominant trees, especially ponderosa pine with an open branchwork, usually 50 to 200 feet above the ground. This species breeds from February through July, with peak activity from March to June. Clutch size is usually two eggs, and incubation usually lasts 34 to 36 days (Zeiner et al. 1990a).

Occurrence in Project Area: There are no recorded CNDDB occurrences of bald eagles within a 10-mile radius of the area of the water development area (CDFG 2006a). The water development area lacks suitable foraging and breeding habit for the bald eagle, such as large bodies of water with abundant fish and adjacent snags. Therefore, this species would not utilize the water development area for breeding or foraging but may be a rare migrant in the vicinity.

Critical Habitat: No critical habitat is designated or proposed for the bald eagle.

Mammals

Giant Kangaroo Rat

The giant kangaroo rat (*Dipodomys ingens*) is Federally and state listed as endangered (CDFG 2006b). This species is included in the *Recovery Plan for Upland Species in the San Joaquin Valley* (USFWS 1998a).

Description and Distribution: This kangaroo rat is a permanent resident of the western San Joaquin Valley (e.g., Carrizo Plain, Panoche Valley). It is found in colonies on fine sandy loam soils supporting sparse annual grass/forb vegetation. Marginal habitat also includes low-density alkali desert scrub. The giant kangaroo rat is a seed eater of peppergrass and filaree (Shaw 1934). Burrows are constructed in level terrain and sandy loam soils. Optimal cover consists of areas with almost no shrub overstory, and very few physiographic variations (Grinnell 1932, Shaw 1934, Hawbecker 1951). This rat breeds from January to May; and peaks in early spring. Litter size ranges from four to six. Predators include kit foxes, badgers, coyotes, barn owls, rattlesnakes, and gopher snakes.

Occurrence in Project Area: There are no recorded CNDDB occurrences of the giant kangaroo rat within a 10-mile radius of the water development area (CDFG 2006a). No habitat for this species is present in the area of the water development area.

Critical Habitat: No critical habitat has been designated or proposed for the giant kangaroo rat.

Fresno Kangaroo Rat

The Fresno kangaroo rat (*Dipodomys nitratoides exilis*) is Federally and state listed as endangered (*Federal Register* 1985, CDFG 2006b). This species is included in the *Recovery Plan for Upland Species in the San Joaquin Valley* (USFWS 1998a).

Description and Distribution: This kangaroo rat once occupied grassland and alkali desert scrub communities on the San Joaquin Valley floor in Merced, Kings, Fresno, and Madera counties, but its range is now very restricted. This kangaroo rat was thought to be extinct in the early 1900s, but was rediscovered in 1933. Fresno kangaroo rats forage on open ground and under shrubs, eating mainly seeds of annual forbs and grasses (CDFG 2000). Breeding occurs from December through September. The young are reared in burrows excavated in sandy soil, with an average litter size of two to three. Much of the habitat for this kangaroo rat has been eliminated or

fragmented by agriculture and development. An additional threat is flooding of habitat along the San Joaquin River.

Occurrence in Project Area: There is a historical CNDDB occurrence of the Fresno kangaroo rat within six miles of the area of the water development area (CDFG 2006a). However, no habitat for this species is present in the water development area.

Critical Habitat: Critical habitat has been designated for the Fresno kangaroo rat, but none is present in the water development area (*Federal Register* 1985).

San Joaquin Kit Fox

The San Joaquin kit fox (*Vulpes macrotis mutica* = kit fox) is Federally listed as endangered and is state-listed as threatened (CDFG 2006b). This species is included in the *Recovery Plan for Upland Species in the San Joaquin Valley* (USFWS 1998a).

Description and Distribution: This species is found in arid regions of the southern half of the state. Kit fox live primarily in the lowlands of the San Joaquin Valley of California, but are also known to occur in several counties in the coast mountain ranges including Santa Barbara, San Luis Obispo, Monterey, San Benito, Santa Clara, Contra Costa and Alameda Counties. This fox species is usually found in open grassland and shrubland communities, but has also been observed on the edges of orchards that border grassland or shrubland plant communities. Cover is provided by dens that are dug in open, level areas with loose-textured, sandy, and loamy soils (Zeiner et al. 1990b). Pups are born in dens excavated in open, level areas with loose-textured soils. Most pups are born February through April, following a gestation period of 49 to 55 days. One litter per year of about four pups is the average. Pups are weaned at about four to five months. Much of the habitat for the kit fox has been eliminated by agriculture.

Kit fox are carnivorous, usually feeding on small rodents such as San Joaquin pocket mice (*Perognathus inornatus*), deer mice (*Peromyscus maniculatus*), western harvest mice (*Reithrodontomys megalotis*), kangaroo rats (*Dipodomy*s spp.) and larger rodents such California ground squirrel (*Spermophilus beecheyi*). Kit fox also prey upon lagomorphs such as black-tailed hare (*Lepus californicus*) and desert cottontail (*Sylvilagus auduboni*).

This fox species relies on subterranean dens for breeding and escape cover from potential predators. Natal and pupping dens occur in areas with solitary or multiple den openings. Both adults care for pups until they are about four to five months old at which time family bond begin to dissolve. Dens are excavated in loose-textured soils, generally in areas with low to moderate relief. Kit fox will also utilize existing burrows excavated by rabbits, ground squirrels, badgers (*Taxidea taxus*), and on occasion will use man-made structures for denning such as well casings, culverts, and abandoned pipelines. Typically, dens are small enough to discourage easy predation by coyotes (*Canis latrans*) and red fox (*Vulpes vulpes*).

Agricultural lands are generally not suitable for long-term occupation by kit foxes due to frequent ground disturbance, pesticide use and the presence of coyotes and red

foxes, although lands adjacent to natural habitats may be used for occasional foraging (Warrick et. al. submitted).

Occurrence in Project Area: There are CNDDB occurrences of kit fox within five miles of the area of the water development area (CDFG 2006a). However, no habitat for this species is present in the water development area.

Critical Habitat: No critical habitat has been designated or proposed for the San Joaquin kit fox.

3.2.1.2 Water Receiving Areas

San Luis Unit

Biological resources setting descriptions below are excerpted from Section 3.10 in the San Luis Unit DEIS (Reclamation 2005c). Undeveloped lands on the valley floor are now restricted to small habitat patches that are fragmented and isolated from each other. Because of the reduction in habitat available to these species, remnants of habitat such as wetlands and riparian forests are increasingly valuable and important to resident and migratory wildlife species. The fish community in the San Luis Unit area is dominated by introduced species and reduced populations of the remaining native warm-water species. Habitats found in the San Luis Unit area include wetlands, riparian communities, rangelands, agricultural habitat, deciduous and evergreen forests, and Significant Natural Areas.

Land Use, Vegetation Communities, and Wildlife Habitat within the San Luis Unit

The San Luis Unit encompasses approximately 1,322 square miles of land situated on arid plains and low hills on the west side of the San Joaquin Valley. It lies between the lowlands of the valley trough and the eastern foothills of the Diablo Range. The unit lies just north and west of the Tulare Lake bed and west of historical marshlands along Fresno Slough and the San Joaquin River, as described above.

Historically, the region surrounding the San Luis Unit contained a diverse and productive patchwork of aquatic, wetland, riparian forest, and terrestrial habitats that supported abundant populations of resident and migratory species of wildlife. The dominant community types associated with the San Luis Unit study area included grasslands, saltbush scrub, and alkali sinks. Historically, huge herds of pronghorns (*Antilocapra americana*), tule elk (*Cervus elaphus*), and mule deer (*Odocoileus hemionus*) grazed the prairies, and large flocks of waterfowl used the extensive wetlands. Other major plant communities included marshes and riparian forests, and vernal pools. The historical descriptions of the area generally describe the eastern portion of the San Luis Unit as a swath of alkaline desert scrub lands outside the flood zone of the lower marshlands of the San Joaquin Valley trough. Going west toward the Coast Range, desert scrub lands intergraded into grasslands that extended past the western boundary of the San Luis Unit (Piemeisel and Lawson 1937). Grasslands of the San Luis Unit were originally dominated by perennial bunch grasses. By the 1930s, desert scrub and native grass communities had been heavily impacted by overgrazing and brush removal and had been almost entirely replaced by annual grasses.

The categories discussed below generally correspond to the land use and land cover types displayed on the figures included in the San Luis Unit DEIS Appendix D (Reclamation 2005c). It also includes a discussion of vegetation types, plants, and animals located in and adjacent to the San Luis Unit study area. In addition to the natural, semi-natural and agricultural communities discussed below, other uses in the San Luis Unit include land developed for industrial and transportation uses, mixed urban uses, residential and commercial development, and land that is barren.

Natural or Semi-Natural Communities

At present, approximately 14 percent of the San Luis Unit's land area remains undeveloped.

Undeveloped lands on the valley floor are now restricted to small habitat patches that are fragmented and isolated from each other. As a result of the conversion of natural habitats, many species have been displaced or extirpated from the region. Most of the species that occurred historically are now restricted to this fragmented and isolated, making it difficult for viable populations to exist. Although species have adapted to portions of the altered landscape and are able to maintain populations, the potential for expansion or growth of these populations is greatly reduced by the fragmentation. Because of the reduction in habitat available to these species, remnants of habitat such as wetlands and riparian forests are increasingly valuable and important to resident and migratory wildlife species.

Most remaining undeveloped lands are along the foothills of the Diablo Range at the western edge of the San Luis Unit. Approximately 71 percent of undeveloped lands are in the hills surrounding the Pleasant Valley near Coalinga and the Kettleman Hills near Avenal. The remaining 29 percent is in the northern portion of the San Luis Unit near Santa Nella and various small parcels throughout the San Luis Unit. These areas, particularly along the Diablo Range foothills, are where the majority of undeveloped upland habitat remains.

Open water in the San Luis Unit is primarily in reservoirs and water conveyance facilities. Streams in the San Luis Unit originate on the Coast Range and typically will carry water for a few hours or days after a rainfall event. Historically, the water from these streams would spread out over the plain of the western San Joaquin Valley and would seldom reach the San Joaquin River (Mead 1901). Except immediately after heavy rainfall events, open water covers less than 1 percent of the study area and is nearly all found in the San Luis Canal, parts of O'Neill Forebay, and various other canals.

On the arid west side of the San Joaquin River basin, relatively small intermittent streams drain the Coast Ranges but rarely reach the San Joaquin River. On the east side, numerous streams and three major rivers drain the western Sierra Nevada and provide flow to the San Joaquin River. The lower San Joaquin River is adjacent to the San Luis Unit study area along portions of the eastern boundary beginning at the Mendota Pool. Mud and Salt Sloughs are tributaries to the San Joaquin River that receive drainage (including tile water and tailwater) from the northern districts, as well as other drainage from their watersheds.

Historical fishery resources within the San Luis Unit study area were different from fishery resources present today. Many native species have declined in abundance and distribution, and several introduced species have become well-established. The major factors producing changes in aquatic habitat within the San Luis Unit project area are habitat modification,

species introduction, and over fishing of fishery resources that originate in the project area. These factors and anthropogenic activities within the San Luis Unit project area have adversely affected the fisheries resources in the area.

Little information exists about fishery resources in water bodies located within the San Luis Unit project area. The intermittent streams located within the project area are not known to support anadromous fish and are unlikely to support populations of resident fish because of their hydrologic conditions, which are often characterized by low flows, increased temperatures, and reduced water quality. The numerous water conveyance facilities and water supply and drainage canals could support warm-water fish, such as bass, crappie, sunfish, catfish, and shad.

Laboratory and field research has demonstrated that elevated waterborne and/or dietary concentrations of several trace elements in the San Joaquin Valley drainwaters are toxic to fish and wildlife. Selenium is the most toxic of these; other constituents include arsenic, boron, chromium, mercury, molybdenum, and salts. Elevated selenium levels have been detected in a wide variety of fish in the San Luis Unit area, including chinook salmon and striped bass. The bio-accumulative food chain threat of selenium contamination on fish and aquatic birds has also been well documented.

Agricultural Habitat

Although natural communities provide the highest value for wildlife, many of these historical natural habitats have been largely replaced by agricultural habitats with varying degrees of benefits to wildlife. The intensive management of agricultural lands, including soil preparation activities, crop rotation, grazing, and the use of chemicals, effectively reduces the value of these habitats for wildlife. However, many wildlife species have adapted to some degree to particular crop types and now use them for foraging and nesting. Orchards, vineyards, and cotton crops generally provide relatively low-quality wildlife habitat because the frequent disturbance results in limited foraging opportunities and a general lack of cover. Pasture and row crops provide a moderate-quality habitat with some limited cover and foraging opportunities.

Approximately 75 to 81 percent of the San Luis Unit is currently used as irrigated farmland. Approximately one-half of the San Luis Unit's irrigated farmland is used for the production of cotton and tomatoes. Approximately 11 percent is used for orchards and vineyards. The remaining farmland is used for a variety of crops, such as alfalfa, asparagus, wheat, melons, corn, grain, and various pasture crops.

Cropland and Pasture

Pasture habitat can consist of both irrigated and unirrigated lands dominated by perennial grasses and various legumes. The composition and height of the vegetation, which varies with management practices, also affects the wildlife species composition and relative abundance. Irrigated pastures may offer some species habitats that are similar to those of both seasonal wetlands and unirrigated pastures. Irrigated pastures provide both foraging and roosting opportunities for many shorebirds and wading birds, including black-bellied plover (*Pluvialis squatarola*), killdeer (*Charadrius*

vociferus), long-billed curlew (*Numenius americanus*), and white-faced ibis (*Plegadis chihi*). Unirrigated pastures, if lightly grazed, can provide forage for seed-eating birds and small mammals. Ground-nesting birds, such as ring-necked pheasant (*Phasianus colchicus*), waterfowl, and western meadowlark (*Sturnella neglecta*), can nest in pastures if adequate vegetation is present. Small mammals occupying pasture habitat include California voles (*Microtus californicus*), Botta's pocket gophers (*Thomomys bottae*), and California ground squirrels (*Spermophilus beecheyi*). Raptors including red-tailed hawks, white-tailed kites, and prairie falcons (*Falco mexicanus*) prey upon the available rodents. In areas where alfalfa or wild oats have been recently harvested, the large rodent populations can provide high-quality foraging habitat for raptors.

The habitat value in cropland is essentially regulated by the crop production cycle. Most crops in California are annual species and are managed with a crop rotation system. During the year, several different crops may be produced on a given parcel of land. Many species of rodents and birds have adapted to croplands, which often requires that the species be controlled to prevent extensive crop losses. This may require intensive management and often the use of various pesticides. Rodent species that are known to forage in row crops include the California vole, deer mouse (*Peromyscus maniculatus*), and the California ground squirrel. These rodent populations are preyed upon by Swainson's hawks (*Buteo swainsoni*), red-tailed hawks, and white-tailed kites.

Orchards and Vineyards

Orchard-vineyard habitat consists of cultivated fruit or nut-bearing trees or grapevines. Orchards are typically open, single-species, tree-dominated habitats and are planted in a uniform pattern and intensively managed. Understory vegetation is usually sparse, but grasses or forbs are allowed to grow between rows to reduce erosion in some areas. In vineyards, the rows under the vines are often sprayed with herbicides to prevent the growth of herbaceous plants.

Wildlife species associated with vineyards include the deer mouse, California quail (*Callipepla californica*), opossum (*Didelphis virginiana*), raccoon (*Procyon lotor*), mourning dove (*Zenaida macroura*), and black-tailed jackrabbit (*Lepus californicus*). Nut crops provide food for American crows (*Corvus brachyrhynchos*), scrub jay (*Aphelocoma californica*), northern flicker (*Colaptes auratus*), Lewis' woodpecker (*Melanerpes lewis*), and California ground squirrel. Fruit crops provide additional food supplies for yellow-billed magpies (*Pica nuttalli*), American robin (*Turdus migratorius*), northern mockingbird (*Mimus polyglottos*), black-headed grosbeak (*Pheucticus melanocephalus*), California quail, gray squirrel (*Sciurus griseus*), raccoon, and mule deer. Loss of fruit to grazers often results in growers using species management programs to force these species away from the orchards.

Special-Status Species

Several special-status species are potentially present in the vicinity of the San Luis Unit. However, no special-status species are expected to be affected by water transfers resulting

from the Proposed Project. A list of these special-status species and an evaluation of their potential to occur is provided in Appendix C.

A list of Federally listed, proposed and candidate species and proposed or designated critical habitat with the potential to occur in the action area was obtained from the USFWS (http://www.fws.gov/sacramento/es/spp_list.htm) on June 19, 2007 (Document Number 070619032337). One species which does not appear on the list, is the California least tern; this species has been documented as foraging at the sewage ponds at Lemoore Naval Air Station.

These species include ten that are Federally listed as endangered: palmate-bracted bird's-beak (*Cordylanthus palmatus*), San Joaquin woolly-threads (*Monolopia congdonii [=Lembertia congdonii]*), longhorn fairy shrimp (*Branchinecta longiantenna*), vernal pool tadpole shrimp (*Lepidurus packardi*), blunt-nosed leopard lizard (*Gambelia silus*), California condor (*Gymnogyps californianus*), giant kangaroo rat (*Dipodomys ingens*), Fresno kangaroo rat (*Dipodomys nitratoides exilis*), Tipton kangaroo rat (*Dipodomys nitratoides nitratoides*), and San Joaquin kit fox (*Vulpes macrotis mutica*).

Eight species that are Federally listed as threatened could potentially occur in the vicinity of the Proposed Action. These species include: vernal pool fairy shrimp (*Branchinecta lynchi*), valley elderberry longhorn beetle (*Desmocerus californicus dimorphus*), delta smelt (*Hypomesus transpacificus*), Central Valley steelhead (*Oncorhynchus mykiss*), California tiger salamander (*Ambystoma californiense*), California red-legged frog (*Rana aurora draytonii*), giant garter snake (*Thamnophis gigas*), and bald eagle (*Haliaeetus leucocephalus*).

Water that will go into the water receiving areas will only be used for existing uses (unless further environmental compliance is completed, as appropriate). Similar to the case with the water development areas, agricultural and urban lands provide only limited utility for a few special-status species. The Main and Outside Canals, which will convey water pumped from the wells, do not provide habitat for the Federally threatened giant garter snake, as they lack well-developed, unshaded freshwater emergent vegetation. Wildlife refuges/management areas near the water receiving areas do provide habitat for the Federally threatened giant garter snake and other special-status species, including several birds that utilize wetland habitats. The lower San Joaquin River is essential fish habitat (migration, holding, rearing) for the fall-run Chinook salmon, and also for the late-fall run on an opportunistic/intermittent basis. The water receiving areas in the San Luis Unit do not contain any designated or proposed critical habitat.

Plants

San Joaquin Woolly-Threads

San Joaquin woolly-threads (*Monolopia congdonii [=Lembertia congdonii]*), is Federally listed as endangered (*Federal Register* 1990b), and is a CNPS List 1B species (CNPS 2001). This species is included in the *Recovery Plan for Upland Species in the San Joaquin Valley* (USFWS 1998a).

Description and Distribution: San Joaquin woolly-threads is an annual herb that flowers from March to May (CNPS 2001). This species is found in sandy soils or in alkaline or loamy plains in chenopod scrub and in valley and foothill grassland, at elevations from 195 to 2625 feet (CDFG 2006a). This woolly-threads is endemic to the San Joaquin Valley, with a historical range from San Benito and Fresno Counties to Santa Barbara and Kern Counties.

Occurrence in San Luis Unit: San Joaquin woolly-threads has been reported within the San Luis Unit (CDFG 2006a).

Critical Habitat: No critical habitat has been designated for San Joaquin woolly-threads.

Invertebrates

Longhorn Fairy Shrimp

Description and Distribution: This information is provided in Section 3.2.1.1.

Occurrence in San Luis Unit: No occurrences of the longhorn fairy shrimp have been reported within ten miles of the San Luis Unit (CDFG 2006a).

Critical Habitat: Critical habitat has been designated for the longhorn fairy shrimp, but no critical habitat occurs within the San Luis Unit (*Federal Register* 2003, 2005a).

Vernal Pool Tadpole Shrimp

Description and Distribution: This information is provided in Section 3.2.1.1.

Occurrence in San Luis Unit: One occurrence of the vernal pool tadpole shrimp has been reported within ten miles of the San Luis Unit (CDFG 2006a).

Critical Habitat: Critical habitat has been designated for the vernal pool tadpole shrimp, but no critical habitat occurs within the San Luis Unit (*Federal Register* 2003, 2005a).

Vernal Pool Fairy Shrimp

Description and Distribution: This information is provided in Section 3.2.1.1.

Occurrence in San Luis Unit: No occurrences of the vernal pool fairy shrimp have been reported within ten miles of the San Luis Unit (CDFG 2006a).

Critical Habitat: Critical habitat was listed for the vernal pool fairy shrimp on August 6, 2003 (*Federal Register* 2003, 2005a). Thirty-five critical habitat units were designated, including 29 units in California. The San Luis Unit does not include any critical habitat areas.

Valley Elderberry Longhorn Beetle

Description and Distribution: This information is provided in Section 3.2.1.1.

Occurrence in San Luis Unit: One historical occurrence for the valley elderberry longhorn beetle is within five miles of the San Luis Unit (CDFG 2006a).

Critical Habitat: Critical habitat was listed for the valley elderberry longhorn beetle on August 8, 1980 (*Federal Register* 1980). The San Luis Unit does not include any critical habitat areas.

Fish

Steelhead Trout

Description and Distribution: This information is provided in Section 3.2.1.1.

Occurrence in San Luis Unit: There are no recorded CNDDB occurrences of steelhead trout within a 10-mile radius of the San Luis Unit (CDFG 2006a). No habitat for this species is present in the area of the San Luis Unit.

Critical Habitat: Critical habitat has been designated for steelhead (*Federal Register* 2006a), but the San Luis Unit does not include any critical habitat areas.

Delta Smelt

Description and Distribution: This information is provided in Section 3.2.1.1.

Occurrence in San Luis Unit: There are no recorded CNDDB occurrences of delta smelt within a 10-mile radius of the San Luis Unit (CDFG 2006a). No habitat for this species is present in the San Luis Unit.

Critical Habitat: Critical habitat has been designated for the delta smelt (*Federal Register* 1994b), but the San Luis Unit does not include any critical habitat units.

Amphibians

California Tiger Salamander

Description and Distribution: This information is provided in Section 3.1.4.

Occurrence in San Luis Unit: There are no recorded CNDDB occurrences of California tiger salamander within a 10-mile radius of the area of the San Luis Unit (CDFG 2006a). No habitat for this species is present in the San Luis Unit

Critical Habitat: A critical habitat determination was published for the California tiger salamander on September 22, 2005 (*Federal Register* 2005), but no critical habitat is present in the San Luis Unit.

California Red-Legged Frog

Description and Distribution: This information is provided in Section 3.2.1.1.

Occurrence in San Luis Unit: A CRLF occurrence has been reported within one mile of the San Luis Unit (CDFG 2006a).

Critical Habitat: Critical habitat was listed for the California red-legged frog on March 13, 2001, including 31 critical habitat units (*Federal Register* 2001). Critical

habitat was remanded and partially vacated by DC District court effective November 6, 2002. A revision of the boundaries of the critical habitat areas was designated on April 13, 2006 (*Federal Register* 2006c). The San Luis Unit does not include any critical habitat units.

Reptiles

Blunt-Nosed Leopard Lizard

Description and Distribution: This information is provided in Section 3.2.1.1.

Occurrence in San Luis Unit: The blunt-nosed leopard lizard has been reported from within the San Luis Unit (CDFG 2006a).

Critical Habitat: No critical habitat is designated or proposed for the blunt-nosed leopard lizard.

Giant Garter Snake

Description and Distribution: This information is provided in Section 3.2.1.1.

Occurrence in San Luis Unit: Although searched for several times (Martin and Christophel 1992, Dickert 2005), giant garter snakes have not been recorded in south San Joaquin Valley since the 1970s and are probably extirpated from there. The last known nearby record near the San Luis Unit was in 1976 at Mendota Dam, 1.5 miles north of Mendota (CDFG 2006a).

Critical Habitat: No critical habitat has been designated or proposed for the giant garter snake.

Birds

California Condor

The California condor (*Gymnogyps californianus*) is Federally and state listed as endangered (*Federal Register* 1967; CDFG 2006b). A recovery plan has been completed for this species (USFWS 1996a), but the San Luis Unit is not located in a recovery area.

Description and Distribution: The California condor requires vast expanses of open savannah, grasslands, or foothill chaparral in mountain ranges of moderate altitude for foraging (CDFG 2006a). For nesting sites, the condor requires deep canyons with clefts in the rocky walls for the nests. The condor forages up to 100 miles from the roost or nest. This species breeds once a year, or less often. Courtship may begin as early as October, and one egg is laid in the period from February to May (Zeiner et al. 1990a). Incubation lasts for approximately 59 days, and the offspring remains in the nest for approximately five months. Fledglings remain dependent on their parents for food for several months after fledging.

Occurrence in San Luis Unit: Although the California condor forages over large distances and could pass over the San Luis Unit, this species has not been reported

from within ten miles of the San Luis Unit (CDFG 2006a). No suitable nesting habitat or mountain ranges for roosting are present in the San Luis Unit.

Critical Habitat: Critical habitat has been designated for the California condor. The San Luis Unit is not located within a critical habitat area (*Federal Register* 1976).

Bald Eagle

Description and Distribution: This information is provided in Section 3.2.1.1.

Occurrence in San Luis Unit: There are no recorded CNDDB occurrences of bald eagle within a 10-mile radius of the San Luis Unit (CDFG 2006a).

Critical Habitat: No critical habitat is designated or proposed for the bald eagle.

Mammals

Giant Kangaroo Rat

Description and Distribution: This information is provided in Section 3.2.1.1.

Occurrence in San Luis Unit: The giant kangaroo rat has been reported from the San Luis Unit (CDFG 2006a).

Critical Habitat: No critical habitat has been designated or proposed for the giant kangaroo rat.

Fresno Kangaroo Rat

Description and Distribution: This information is provided in Section 3.2.1.1.

Occurrence in San Luis Unit: The Fresno kangaroo rat has been reported from the San Luis Unit (CDFG 2006a).

Critical Habitat: Critical habitat has been designated for the Fresno kangaroo rat, but none is present in the San Luis Unit (*Federal Register* 1985).

Tipton Kangaroo Rat

The Tipton kangaroo rat (*Dipodomys nitratoides nitratoides*) is Federally and state-listed as endangered (*Federal Register* 1988; CDFG 2006b). This species is included in the *Recovery Plan for Upland Species in the San Joaquin Valley* (USFWS 1998a).

Description and Distribution: The Tipton kangaroo rat is found in saltbrush scrub and sink scrub communities in the Tulare Lake basin of the southern San Joaquin Valley (CDFG 2006a). This species needs soft friable soils which are not subject to seasonal flooding. The Tipton kangaroo rat digs burrows in elevated soil mounds at bases of shrubs.

Occurrence in San Luis Unit: The Tipton kangaroo rat has been reported within five miles of the San Luis Unit (CDFG 2006a).

Critical Habitat: No critical habitat has been designated for the Tipton kangaroo rat.

San Joaquin Kit Fox

Description and Distribution: This information is provided in Section 3.2.1.1.

Occurrence in the San Luis Unit: The kit fox has been reported from the San Luis Unit (CDFG 2006a).

Critical Habitat: No critical habitat has been designated or proposed for the San Joaquin kit fox.

Santa Clara Valley Water District

Biological resources setting descriptions below are excerpted from the Biological Assessment for the San Felipe Division long-term contract renewal (LTCR). (Reclamation 2007c)

Historically, lands in the Santa Clara Valley Water District supported a diversity of natural vegetation types consisting of freshwater and saline emergent wetlands, riparian forest, grasslands, and adjacent higher elevation habitats. Urban and agricultural development resulted in the conversion of natural communities and reductions and fragmentation of natural communities. Urban and agricultural development has been focused in lowland areas. Riparian land cover in the lower watersheds has declined in quality and quantity as a result of vegetation removal for levee construction and bank protection, flow regulation, groundwater pumping, channel modification, encroachment of urban land uses, and spread of invasive species. The extent and characteristics of saline and freshwater emergent wetlands has been similarly altered by these activities. While natural land cover types in lowland areas have been reduced and continue to be affected by urban and agricultural activities, extensive natural community areas (oak woodlands, coastal scrub/chaparral and hardwood/conifer forest) remain in the foothills and in higher elevation areas.

Biological resources in Santa Clara County currently are dominated by wildlife species adapted to urban trees and landscaping. Streams are often vegetated with willow (*Salix* spp.), Fremontia, cottonwood, box elder, and western sycamore. They support warm and cold water fisheries. Several types of marshes occur in the county, primarily along edges of San Francisco Bay. (Reclamation 2004b)

Land Use, Vegetation Communities, and Wildlife Habitat within the CVP/SCVWD Water Receiving Area

The types, amounts, and distribution of land uses and land cover in the service areas were primarily derived from the California GAP land cover data. In the California GAP Analysis, land use/land cover is typed based on the California Wildlife Habitats Relationship System (CWHR).

Annual Grasslands

Annual grassland is a common land cover type in the CVP/SCVWD area. Historically, grasslands were dominated by native perennial grasses such as needlegrass (*Nasella* sp.). Currently, most grasslands in the area are dominated by

introduced annual grasses of Mediterranean origin and a mixture of native and introduced forbs. Introduced annual grasses are the dominant plant species.

Valley-foothill Riparian

Valley foothill riparian land cover develops in the flood plains of low-gradient rivers and streams. Typically, riparian land cover occurs as narrow bands of vegetation immediately adjacent to watercourses. Dominant tree species of valley foothill riparian land cover are cottonwood (*Populus fremontii*), California sycamore (*Plantanus racemosa*), and valley oaks (*Quercus lobata*). Typical shrub species include willows (*Salix* sp.), elderberry (*Sambucus* sp.), and wild grape (*Vitis californica*).

Wetlands

The following three types of wetlands occur in the CVP/SCVWD area: freshwater emergent wetlands, saline emergent wetlands, and vernal pools.

Freshwater Emergent Wetlands

Freshwater emergent wetlands occur in areas that are seasonally or perennially inundated. They form a transitional community between open water and upland communities and occur in backwater areas of rivers, streams and lakes, and in the flood plains of rivers and streams. Wetlands are characterized by erect rooted, herbaceous vegetation that emerges above the water surface. Common plant species include cattails (*Typha* sp.), bulrushes (*Scirpus* sp.), and rushes (*Juncus* sp.).

Saline Emergent Wetlands

In the CVP/SCVWD area, saline emergent wetlands only occur at the northern edge of Santa Clara County. Much of the former saline emergent wetlands along Coyote Creek, Alviso Slough and Guadalupe Slough have been converted to fresh- and brackish-water vegetation due to freshwater discharge from wastewater facilities and is of lower quality for species such as the salt marsh harvest mouse and California clapper rails (*Rallus longirostris obsoletus*). Some saline emergent wetland communities remain around the Coyote Creek Flood Control Bypass.

Vernal Pools

Vernal pools are typically found in association with annual grassland communities but constitute a unique habitat type. Vernal pools form in shallow depressions that are underlain by hardpan or volcanic rock. The hardpan or volcanic rock impedes drainage such that, in winter, the depressions fill with water and retain moist soil into late spring. The pools are then dry during the summer and fall until rains commence the following winter. The soils and moist microhabitat of these pools provides a unique habitat within a general matrix of annual grassland communities.

The number and distribution of vernal pools have been greatly reduced as a result of agricultural practices and conversion to urban land uses. It is unknown whether any vernal pools remain in Santa Clara County.

Oak Woodland

Oak woodland is common in the CVP/SCVWD area, occurring between annual grasslands at lower elevations and coastal scrub/chaparral and hardwood/conifer forest at higher elevations. Typically it occurs at elevations up to 3,000 to 4,000 feet.

Blue oak (*Quercus douglasii*) is the dominant overstory species of blue oak woodland and blue oak/foothill pine woodland. Foothill pine (*Pinus sabiniana*) becomes an important overstory species at higher elevations. Typical shrub species in blue oak woodland are poison-oak (*Toxicodendron diversilobum*), coffeeberry (*Rhamnus californica*), redbud (*Cercis occidentalis*), ceanothus (*Ceanothus* sp.), and manzanita (*Arctostaphylos* sp.) with ground cover consisting of annuals such as bromegrass, wild oats, foxtail, and filaree (Mayer and Laudenslayer 1988).

Coastal oak woodland occurs in the Coast Range in the western portion of the CVP/SCVWD area. In this woodland, coastal live oak (*Quercus agrifolia*) is the dominant overstory species and can be the only overstory species in some locations. In mesic areas, California bay (*Umbellularia californica*), Pacific madrone (*Arbutus menziesii*), tanoak (*Lithocarpus densiflorus*), and canyon live oak (*Quercus chrysolepis*) contribute to the overstory. The understory typically consists of shade-tolerant shrubs such as California blackberry (*Rubus ursinus*), creeping snowberry (*Gaultheria hispidula*) and toyon (*Heteromeles arbutifolia*).

Hardwood/Conifer Forest

Hardwood/conifer forest occurs at the highest elevations in Santa Clara County. Hardwood/conifer forest in Santa Clara County consists of four CWHR community types: montane hardwood, montane hardwood-conifer, redwood, and ponderosa pine.

Montane hardwood forest occurs in eastern portions of the Santa Clara County at lower elevations than conifer forest communities, although it can be interspersed with ponderosa pine (*Pinus pondersosa*). This forest type is dominated by hardwood tree species including coastal live oak, California black oak (*Quercus kelloggii*), tanoak, and Pacific madrone, but often includes some conifers, such as gray pine and ponderosa pine. Typical understory shrub species include manzanita, poison-oak, coffeeberry, currant (*Ribes* sp.), and ceanothus.

Montane hardwood-conifer communities are similar to montane hardwood but include both conifers and hardwoods, often as a closed forest. Hardwood species are the same as in montane hardwood communities. Typical conifer species are Douglas-fir (*Pseudotsuga menziesii*), ponderosa pine, and redwood (*Sequoia sempervirens*). The specific composition of this land cover type varies in response to soil type, exposure and moisture among other factors.

Ponderosa pine communities are dominated by pondersosa pines. It may occur in pure stands or in stands of mixed species where at least 50 percent of the canopy cover is

created by ponderosa pine. Typically this forest type supports rather sparse understory and herbaceous cover.

Redwood communities are dominated by redwoods. Understory vegetation is usually dense, consisting of tall shrubs. Douglas-fir is a common associate.

Coastal Scrub/Chaparral

Coastal scrub/chaparral communities occur along the southern and eastern borders of Santa Clara County. These communities consist of structurally homogenous brushland dominated by shrubs. Shrub height and crown cover vary considerably with fire frequency, precipitation, aspect, and soil type. Chaparral land cover in the CVP/SCVWD area includes three types of communities distinguished by CWHR: Chemise-Redshank Chaparral, Mixed Chaparral, and Coastal Scrub.

Serpentine

Serpentine is distinguished by soil type rather than by dominant plant species. Serpentine soils are formed from weathered volcanic (ultramafic) rocks such as serpentinite, dunite, and peridotite. These soils provide a harsh environment for plant growth. As a result of these harsh conditions, serpentine soils support unique grassland communities that include endemic species such as fountain thistle (*Cirsium fontinale* ssp. *fontinale*), Santa Clara Valley dudleya (*Dudleya setchellii)*, Marin dwarf-flax (*Hesperolinon congestum*), Metcalf Canyon jewelflower (*Streptanthus albidus* ssp. *albidus*), uncommon jewelflower (*S. albidus* ssp. *peramoenus*), and coyote ceanothus (*Ceanothus ferrisae*).

Barren

Barren areas are devoid of vegetation or support very sparse vegetation (< 2%). Barren areas can be natural or human-created. Natural barren areas include sand bars, rock outcrops, beaches and mudflats. Human-created barren areas include quarries, roads and buildings. Small areas typed as Barren (< 1,000 acres total) occur in the service area of SCVWD.

Lacustrine

Lacustrine land types are inland depressions containing standing water. They vary in size and characteristics and include natural lakes, reservoirs, dammed river channels, and ponds. This aquatic land cover type can be associated with rivers and freshwater emergent wetlands. Shallow, temporary habitats may support rooted plants, whereas deep permanent water bodies are primarily open water. Permanent open waters can support emergent and aquatic plants in shallow areas along the margins of the waterbody. Large areas of lacustrine communities are supported at Lexington Reservoir, Guadalupe Reservoir, Calero Reservoir, Uvas Reservoir, Coyote Lake, and Anderson Lake.

Other Surface Water

Riverine land cover types are aquatic areas characterized by moving water. The nature and characteristics of riverine land cover can vary considerably. Depending on the size of the drainage basin and topography, riverine land cover can consist of large, slow-moving water to small, fast-moving water found in higher elevation drainages. Major watercourses in the CVP/SCVWD area are Coyote Creek, the Guadalupe River and the San Benito River, which has very little flow during summer months.

Agricultural

Agricultural land use is common in the CVP/SCVWD area and consists of a variety of row crops and field crops. Crop types vary from year-to-year depending on market conditions and other factors. Agricultural fields have replaced native communities consisting of grasslands, wetlands, and oak woodlands. Although some listed species potentially forage or travel through agricultural fields, no listed species relies on this type of land use as an essential component of habitat requirements.

Vineyards/Orchards

Orchard land use consists of cultivated fruit or nut-bearing trees. Typically, they are open, tree-dominated areas consisting of a single tree species. This type of land use is planted in a uniform pattern and intensively managed. Understory vegetation is usually sparse; however, in some areas, grasses or forbs are allowed to grow between orchard rows to reduce erosion. Walnuts and olives are the primary orchard crops in the CVP/SCVWD area. Wildlife use of orchards is typically limited. Ground squirrels (*Spermophilus beecheyi*) and other small mammals can inhabit understory areas and birds such as scrub jays (*Aphelocoma californica*) may be seasonally attracted to fruit orchards.

Special-Status Species

Several special-status species are potentially present in the vicinity of the Santa Clara Valley Water District. However, no special-status species are expected to be affected by water transfers resulting from the proposed project. A list of these special-status species and an evaluation of their potential to occur is provided in Appendix C.

A list of Federally listed, proposed and candidate species and proposed or designated critical habitat with the potential to occur in the action area was obtained from the USFWS (http://www.fws.gov/sacramento/es/spp_list.htm) on June 19, 2007 (Document Number 070619032337).

These species include fourteen that are Federally listed as endangered, some of which have designated critical habitat: tidewater goby (*Eucyclogobius newberryi*), central California coast coho salmon (*Oncorhynchus kisutch*), winter-run Chinook salmon (*Oncorhynchus tshawytscha*), San Francisco garter snake (*Thamnophis siralis tetrataenia*), California brown pelican (*Pelcanus occidentalis californincus*), California clapper rail (*Rallus longirostris obsoletus*), California least tern (*Sternula antillarum browni*), least Bell's vireo (*Vireo bellii pusillus*), salt marsh harvest mouse (*Reithrodontomys raviventris*), San Joaquin kit fox

(*Vulpes macrotis mutica*), Tiburon paintbrush (*Castilleja affinis* ssp. *neglecta*), Coyote ceanothus (*Ceanothus ferrisae*), Santa Clara Valley dudleya (*Dudleya setchellii*) and the Metcalf Canyon jewelflower (*Streptanthus albidus* ssp. *albidus*).

Eleven species that are Federally listed as threatened could potentially occur in the vicinity of the Proposed Action. These species include: vernal pool fairy shrimp (*Branchinecta lynchi*), bay checkerspot butterfly (*Euphydryas editha bayensis*), central California coastal and south central coast steelhead (*Oncorhynchus mykiss*), Central Valley spring-run Chinook salmon (*Oncorhynchus tshawytscha*), California tiger salamander (*Ambystoma californiense*), California red-legged frog (*Rana aurora draytonii*), Alameda whipsnake (*Masticophis lateralis euryxanthus*), marbled murrelet (*Brachyramphus marmoratus*), western snowy plover (*Charadrius alexandrinus nivosus*) and the bald eagle (*Haliaeetus leucocephalus*).

Water that would transfer to the water receiving areas will only be used for existing uses (unless further environmental compliance is completed, as appropriate as explained in Section 2.4). Similar to the case with the water development areas, these lands provide only limited utility for a few special-status species. Although critical habitat for several species has been designated in Santa Clara County, none occurs in the areas that would receive water under the Proposed Action or Action Alternatives.

3.2.2 Regulatory Setting

3.2.2.1 Federal Endangered Species Act

The Federal Endangered Species Act (FESA) defines "endangered" species as those in danger of extinction throughout all or a significant portion of their range. A "threatened" species is any species that is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range. Additional special-status species include "candidate" species and "species of concern." Candidate species are those for which the Service, or National Oceanic & Atmospheric Administration (NOAA) Fisheries if applicable, has enough information on file to propose listing as endangered or threatened. "Species of concern" are those for which listing is possibly appropriate, but for which the Service or NOAA Fisheries lacks sufficient information to support a listing proposal. A species that has been "delisted" is one whose population has met its recovery goal target and is no longer found to be in jeopardy of extinction. These agencies also may designate Critical Habitat for listed species.

Federally-listed species may be addressed for a proposed project in one of two ways: (1) a non-Federal government entity may resolve potential adverse impacts to species protected under FESA Section 10, or (2) a Federal lead agency regulates the proposed project in accordance with FESA Section 7. Section 7 defines a process for the Federal lead agency to consult with the responsible Federal resource agency (the Service or NOAA Fisheries), to determine whether the proposed water transfer program is likely to adversely affect species that are listed or proposed for listing. The Section 7 process typically requires the preparation of a Biological Assessment by the Federal lead agency followed by the preparation of Biological Opinion by the responsible Federal resource agency. Consultation under Section 7 is limited to projects with a Federal nexus. Other projects that may result in take or harm of a Federally listed species require a Section 10 permit from the Service and/or NOAA Fisheries.

The Section 10 process typically requires the project proponent to prepare a Habitat Conservation Plan (HCP). A permit is issued by the Service and/or NOAA Fisheries once the HCP is approved.

3.2.2.2 California Endangered Species Act

The California Endangered Species Act (CESA) and the Native Plant Protection Act authorize the California Fish and Game Commission to designate endangered, threatened, and rare species and to regulate the taking of these species (Sections 2050–2098, Fish and Game Code). CESA defines "endangered" species as those whose continued existence in California is jeopardized. State-listed "threatened" species are those not presently threatened with extinction but which may become endangered if their environments change or deteriorate. Protection of special-status species is detailed in Sections 2050 and 2098 of the Fish and Game Code. In addition to recognizing three levels of endangerment, DFG can provide interim protection to candidate species while they are being reviewed by the Fish and Game Commission. Formal consultation must be initiated with DFG for projects that may have an adverse effect on a State-listed species in accordance with the State lead agency.

Section 2080 of the California Fish and Game Code prohibits the taking of State-listed plants and animals. DFG also has the authority to designate State endangered and rare plants and provide specific protection measures for identified populations under the Native Plant Protection Act of 1977. DFG also designates "fully protected" or "protected" species as those that may not be taken or possessed without a permit from the Fish and Game Commission and/or DFG. Species designated as fully protected or protected may or may not be listed as endangered or threatened.

DFG also maintains a list of animal "Species of Special Concern," most of which are species whose breeding populations in California may face extirpation. Although these species have no legal status, DFG recommends consideration of them during analysis of the impacts of proposed projects to protect declining populations and avoid the need to list them as endangered in the future.

DFG's implementation of CESA has created a program that is similar in structure to, but different in detail from, the Service program implementing FESA.

3.2.2.3 Fish and Wildlife Coordination Act

This act establishes a general policy that fish and wildlife conservation shall receive equal consideration with other project purposes and will be coordinated with other features of water resources development projects. To accomplish this, section 2(b) of the FWCA establishes that preconstruction planning on project development shall be coordinated with the U.S. Fish and Wildlife Service, The FWCA authorizes the Service and State agencies responsible for fish and wildlife resources to investigate proposed Federal actions that would impound, divert, deepen, or otherwise control or modify a stream or waterbody and to make mitigation and enhancement recommendations to the involved Federal agency. According to the act, "Recommendations … shall be as specific as practicable with respect to features recommended for wildlife conservation and development, lands to be utilized or acquired for such purposes, the results expected, and shall describe the damage to wildlife attributable to the project and the measures proposed for mitigating or compensating for these damages."

3.2.2.4 Magnuson-Stevens Fisheries Act

The Amended Magnuson-Stevens Fishery Conservation and Management Act, also known as the Sustainable Fisheries Act (Public Law 104-297), requires all Federal agencies to consult with the Secretary of Commerce on activities, or proposed activities, authorized, funded, or undertaken by that agency that may adversely affect Essential Fish Habitat (EFH) (Office of Habitat Conservation 1999). The EFH provisions of the Sustainable Fisheries Act are designed to protect fisheries habitat from being lost due to disturbance and degradation.

3.2.2.5 Migratory Bird Treaty Act

The Migratory Bird Treaty Act of 1918 (16 United States Code 703–711) makes it unlawful to take, possess, buy, sell, purchase, or barter any migratory bird listed in 50 CFR Part 10, including feathers or other parts, nests, eggs, or products, except as allowed by implementing regulations (50 CFR 21). Disturbance that causes nest abandonment and/or loss of reproductive effort (e.g., killing or abandonment of eggs or young) may be considered a "take" and is potentially punishable by fines and/or imprisonment.

3.2.2.6 Executive Order 11990 (Protection of Wetlands)

Executive Order 11990 (Protection of Wetlands) requires Federal agencies to take actions to minimize the destruction, loss, or degradation of wetlands, and to preserve and enhance the natural and beneficial values of wetlands when undertaking Federal activities and programs. Any agency considering a proposal that might affect wetlands must evaluate factors affecting wetland quality and survival. These factors should include the proposal's effects on the public health, safety, and welfare due to modifications in water supply and water quality; maintenance of natural ecosystems and conservation of flora and fauna; and other recreational, scientific, and cultural uses.

3.3 Cultural Resources

3.3.1 Native American Prehistory and History

3.3.1.1 Prehistory

Archaeological work in the San Joaquin Valley has been limited. According to Hartzell (1992), initial human occupation of the project area apparently occurred as early as 8000 B.P. The discovery of Clovis-like stemmed and transverse (crescent) projectile points at locations both away from and adjacent to primary water sources suggest that early cultures were reliant on both lacustrine and megafaunal resources.

A gap or hiatus in the archaeological record between 7000 and 4000 B.P. characterizes the next phase and may reflect shifting subsistence and settlement practices in response to climatic and/or environmental fluctuations. The penultimate part of the sequence includes a proliferation of occupation sites (located both adjacent to and removed from the lakeshore), house structures, and diversified material culture assemblages.

The final period, falling after 1000 B.P., is associated with an apparently diminished archaeological record, particularly in regard to lakeshore village sites. Jackson et al. (1999)

and Siefkin (1999) have questioned many aspects of Hartzell's sequence, but until further evidence proves otherwise, the sequence still serves as a valid, testable model.

3.3.1.2 Ethnography

In late prehistory, the San Joaquin Valley was populated by Valley Yokuts, the largest ethnic group in precontact California. The Yokuts were divided into three groups – Northern Valley, Southern Valley, and Foothill – composed of approximately 60 tribelets, each with a few hundred to several thousand (Moratto 1984). The project area lies within the traditional lands of the Northern Valley and Southern Valley Yokuts.

Northern Valley Yokuts

Northern Valley Yokuts material culture included structures, basketry, watercraft, and tools. Tule was the primary component in the construction of small, lightly built houses, as well as basketry, mats, and cradles. Rafts made of lashed together bundles of tule were used for travel and fishing. Stone, wood, and bone were used to manufacture a variety of tools. Arrowpoints, knives, and scraping tools were chipped from local chert, jasper, and chalcedony. While potsherds do occur, earthenware vessels were not made locally and appear to be trade pieces (Wallace 1978).

The Northern Valley Yokuts centered around the San Joaquin River. A maze of channels, levees, and sloughs created a habitat that was the main source of their subsistence. Fishing was their main food source, and salmon, available during fall spawning, was their most important resource. Other fish, including white sturgeon, river perch, western suckers, and Sacramento pike, were available year round. Fowl, such as duck and geese, were also available in the riverine environment. Acorns, tule roots, and seeds were also foraged as main components of the Northern Valley Yokuts diet. While summers in the valley were extremely hot and winters cool, resources created an environment favorable for year-round habitation.

Northern Valley Yokuts used both water and foot travel to exploit an extensive trade network. They traded for baskets and bows and arrows with the Miwok to the north, and mussel and abalone shell with the Costanoan to the west (Wallace 1978).

Southern Valley Yokuts

The southern portion of the project area is in the traditional territory of the Southern Valley Yokuts. During the late prehistoric period an intricate cultural complex was defined for the study area and the southern San Joaquin Valley. Southern Valley Yokuts material culture included structures, basketry, watercraft, weapons, and tools. The ubiquitous tule was the primary component in the construction of houses, as well as other fiber crafts, such as basketry, mats, and cradles. Like the North Valley Yokuts, rafts of tule and balsa were central to the Southern Valley Yokuts economy base. Stone, wood, and bone were used to manufacture weapons and a variety of tools. In archaeological contexts, flaked stone and ground stone tools are the most commonly found remnants of the Southern Valley Yokuts culture (Wallace 1978).

The Southern Valley Yokuts enjoyed the rich environment comprising the Tulare, Buena Vista, and Kern Lake basins and their related river systems. Swamps and tule marshes surrounded these waterways which teemed with wildlife, including fish, aquatic mammals,

and birds. Adjacent expanses of grasslands were home to herds of elk, antelope, and in the winter, deer. The flora of this region was equally, if not more, diverse. Consequently, the Southern Valley Yokuts had a mixed economic strategy of fishing, waterfowl hunting, and shellfish and plant collecting, with less of an emphasis on large game. Tule, cattail roots, grass, nuts, seeds, and bulbs were important vegetal resources. The resource-rich environment allowed for permanent Southern Valley Yokuts village sites, which were occupied during most of the year.

Items not found locally were obtained through an extensive trade network. Good quality stone and wood were lacking in the valley environment and were often acquired through trade. Imported trade items included acorns, obsidian, salt, and seashells, which were exchanged for locally available asphaltum, steatite, and animal skins (Gayton 1948, Latta 1949, Wallace 1978).

3.3.1.3 History

Spanish Exploration and Colonization

The Spanish government began to take an active interest in colonizing what was then known as Alta California in the late eighteenth century by sending exploratory expeditions into the area along the Pacific coast from Baja California to the Sacramento River. Expeditions to investigate the Central Valley began with Father Jose Maria de Zalvidea in 1806. Subsequent incursions into the interior were often conducted to return Native American mission escapees to the missions on the coast (Beck and Haase, 1974).

Early expeditions into Alta California led to construction of Spanish missions in the interior regions and along the coast of California. The mission system was crucial to the colonizing process of Alta California, focusing on converting Native Americans to Christianity and introducing them to the Hispanic lifeways and culture. A less overt but significant goal was to provide a working class for the Mission and Spanish landholders.

Establishment of Spanish settlements accelerated the spread of infectious diseases, which in turn led to drastic reductions in Native American populations. Soon after the establishment of the mission system, a process of granting large parcels of land to prominent individuals began. Within a few years ranchos occupied large tracts in the vicinity of the missions and a pastoral economy involving the missions, the ranchos, and native inhabitants was established.

Mexican Independence and the Ranchos

With the declaration of Mexican independence in 1821, Spanish control of Alta California came to an end, though little actual change occurred. Political change did not begin in earnest until mission secularization in 1834, when Native Americans were freed from missionary control and the mission lands were granted to private individuals.

Shoup and Milliken (1999) state that mission secularization removed the social protection and support on which Native American populations had come to rely. It exposed them to additional exploitation by outside interests, often forcing them into a marginal existence as laborers for large landholders. Following secularization of the missions, the Mexican population continued to grow while the Native American population continued to decline.

During this period, Europeans began to arrive and settle in Alta California, often marrying into Mexican families, becoming Mexican citizens, and receiving land grants.

Anglo-American Expansion

Jedediah Smith led the first American exploration into the San Joaquin Valley in 1826 and other fur-trapping expeditions soon followed. The American annexation of California in 1846 and the Gold Rush beginning in 1849 resulted in a huge increase of settlers in the San Joaquin Valley. Loss of traditional gathering and hunting areas, armed conflict, and introduced diseases took their toll, resulting in a catastrophic decline in population and continued disruption of traditional lifeways.

In the mid-1850s, a few of the decimated Northern Valley Yokuts tribes signed treaties for land that never materialized. Conditions worsened until Federal authorities stepped in and set aside land on the Fresno and the Tule River Reserve. The majority of the remaining Southern Valley Yokuts were also settled onto reservations. Two of those reservations, the Tule River and the Santa Rosa Rancheria near Lemoore exist today and the Yokuts people of the southern San Joaquin Valley continue to be a viable cultural entity (Shapiro and Jackson 1998; Wallace 1978).

By the 1870s, agricultural had become established in the region. Large-scale diversion of water from the San Joaquin River in the late 1880s turned to pump technology and the use of groundwater in the early 1900s. New farming techniques and irrigation made agriculture possible on a massive scale, but with devastating consequences to prehistoric sites. Unfortunately, few remain undisturbed. The majority of cultural resources in the area are likely to be associated with historic agriculture.

3.3.2 Archival Research and Results

3.3.2.1 Archival Research

Staff at the Southern San Joaquin Valley Information Center (SSJVIC) of the California Historical Resources Information System (CHRIS) conducted a record search for the proposed field well on January 13, 2006. The search consisted of a review of:

- SSJVIC databases of archaeological sites and studies within a 1/4 mile of the well development area;
- National Register of Historic Places (NRHP), Directory of Determinations of Eligibility, California (National Park Service 1988);
- California Register of Historic Resources (CRHR) (State of California 2002);
- California Historical Landmarks (State of California 1996);
- California Points of Historical Interest (State of California 1992);
- Historic Property Date File (2005); and
- California Inventory of Historical Resources (State of California 1976).

Archival research was also conducted as part of the San Luis Unit Draft EIS (Reclamation 2005c).

3.3.2.2 Previous Archaeological Investigations and Known Cultural Resources

Water Development Areas

According to the SSJVIC, nine previous archaeological investigations have been conducted within the proposed well field. Eight previous investigations have been conducted within a one-quarter mile radius of the [p]. There are four previously recorded cultural resources within the well development area. One is a prehistoric resource, and three are historic resources. The prehistoric site, P-10-000105 (CA-FRE-105), is a burial site with associated artifacts. The historic resources include the San Joaquin and Kings River Main Canal, P-10-005204, the Delta-Mendota Canal, P-10-005166, and the Delta-Mendota Canal Bridge, P-10-005165. There are no recorded cultural resources within a one-quarter mile radius of the proposed well field. None of the cultural resources previously recorded within the well development area are listed in the CRHR, NRHP, California Inventory of Historical Resources, California Points of Historical Interest, or California Historical Landmarks.

Water Receiving Areas

San Luis Unit

- As reported in the San Luis Unit DEIS, Section 3.11 (Reclamation 2005c), a total of 67 archaeological and historic sites are currently documented within the contract service areas of the San Luis Unit contractors. These include sites that contain exclusively prehistoric material, sites with only historic material, sites with mixed prehistoric and historic components, and structures.
- Prehistoric sites are represented by habitation areas (village sites) in which both habitation and special-use activity areas are represented; mortuary sites; specialized food-procurement and food-processing sites; and other site types representing a variety of specialized activities (Reclamation 2005c).
- Historic sites are represented by a range of types, including buildings and structures dating to the nineteenth and early through mid-twentieth centuries; historic transportation features; water distribution systems; occupation sites and homesteads with associated features such as refuse disposal areas, privy pits, barns, and sheds; historic disposal sites associated with historic communities; and ranch complexes (Reclamation 2005c).
- Some of these prehistoric and historic sites have been determined eligible for inclusion on the NRHP through consultation between a Federal agency and the State Historic Preservation Office (SHPO). Others remain unevaluated. (Reclamation 2005c)

In addition to formally recorded sites, it is probable that both prehistoric and historic sites remain undiscovered within the San Luis Unit study area simply because for many areas, especially on undeveloped ranch and farm lands, formal archaeological inventory surveys have not been undertaken (Reclamation 2005c).

Table 3.3-1 summarizes the current cultural resources inventory by SLU contractor. The table also provides a conclusion as to whether the service area is known or, if subjected to formal archaeological survey, would be likely to be discovered to contain important

prehistoric or historic sites or other cultural features. This conclusion or assessment is based on (a) the results of the formal records search, (b) previous consultation with Native American groups and historical societies as summarized in existing archaeological reports and other documents, (c) the results of prior surveys in the general or immediate vicinity, and (d) an assessment of archaeological sensitivity based on stream courses and other critical variables present within unsurveyed contractor service areas. (Reclamation 2005c)

Table 3.3-1. Summary of Previous Studies and Cultural Properties in the San Luis Unit

San Luis Unit Contractor	Recorded Sites or Landmarks	Percentage Surveyed to Date	Are Undocumented Sites Likely to be Present in Service Area?
City of Avenal	25	9%	Yes
City of Coalinga	0	1%	Yes
City of Huron	0	0%	Yes
Pacheco Water District	12	5%	Yes
Panoche Water District	0	12%	Yes
San Luis Water District	28	5%	Yes
Westlands Water District	2	2%	Yes
Total	67		

Santa Clara Valley Water District

The Ohlone, or Costanoan, Indians inhabited the Santa Clara County area in prehistoric times. The Ohlones were gatherers and hunters who utilize native flora and fauna such as acorns, tule, ducks, and deer for food, shelter, and trade items. Beginning in the late 1700s, Spanish explorers and missionaries arrived in Santa Clara County. Settlers began to develop land in Santa Clara County first as ranchland, and by the mid-1800s as agricultural land, particularly for orchards. Many settlements during prehistoric and historic times were located adjacent to water ways. Native American artifacts and occasional burials are most frequently found in association with existing or prior locations of creeks. Many of the historic neighborhoods and buildings are associated with the original settlements along the Guadalupe River, including the Pueblo de San Jose, which was the first civil settlement in Alta California. (Reclamation 2004b)

3.3.3 Regulatory Setting

3.3.3.1 Historical Evaluation per the Code of Federal Regulations

Section 106 of the National Historic Preservation Act requires the Federal Government to take into account the effects of an undertaking on cultural resources listed on or eligible for listing on the National Register of Historic Places (National Register) and afford the Advisory Council on Historic Preservation a reasonable opportunity to comment. Those resources that are on or eligible for inclusion in the National Register are referred to as historic properties. The 36 CFR Part 800 regulations describe the Section 106 process that the Federal agency takes to identify cultural resources and the level of effect that the proposed undertaking will have on historic properties. An undertaking is defined as any:

"…Project, activity or program funded in whole or in part under the direct or indirect jurisdiction of a Federal agency, including:

A) those carried out by or on behalf of the agency;

B) those carried out with Federal assistance;

C) those requiring a Federal permit, license, or approval; and

D) those subject to state or local regulation administered pursuant to a delegation or approval by a Federal agency [Section 301(7) 16 U.S.C. 470w(7)]

It is the initiating of an undertaking that begins the Section 106 process. Once an undertaking is initiated the Federal agency must first determine if the action is the type of action that has the potential to affect historic properties. If the action is the type of action to affect historic properties, 1) Federal agency must identify the area of potential effects (APE), 2) determine if historic properties are present within that APE, 3) determine the effect that the undertaking will have on historic properties, 4) and consult with the State Historic Preservation Office (SHPO) to seek concurrence on Federal agencies findings. In addition, the Federal agency is required through the Section 106 process to consult with Indian Tribes concerning the identification of sites of religious or cultural significance, and consult with individuals or groups who are entitled to be consulting parties or have requested to be consulting parties. If the undertaking will result in adverse effects to historic properties, these adverse effects must be resolved in consultation with the SHPO and other parties identified during the Section 106 process before the undertaking can proceed to implementation.

Section 101 of the NHPA directs the Secretary of the Interior to expand and maintain a National Register of Historic Places (NRHP). The NRHP, created under the NHPA, is the Federal list of historic, archaeological, and cultural resources worthy of preservation. Resources listed in the NHRP include districts, sites, buildings, structures, and objects that are significant in American history, prehistory, architecture, archaeology, engineering, and culture. The NRHP is maintained and expanded by the National Park Service on behalf of the Secretary of the Interior. The Office of Historic Preservation in Sacramento, California, administers the local NRHP program under the direction of the State Historic Preservation Officer (SHPO). To guide the selection of properties included in the NRHP, the National Park Service has developed the NRHP Criteria for Evaluation. The criteria are standards by which every property that is nominated to the NRHP is judged. The quality of significance in American history, architecture, archaeology, and culture is possible in districts, sites, buildings, structures, and objects that possess integrity of location, design, setting, material, workmanship, feeling, and association, and meet one of the following criteria:

- Criterion A: Are associated with events that have made a significant contribution to the broad patterns of our history; or
- Criterion B: Are associated with the lives of persons significant in our past; or
- Criterion C: Embody the distinctive characteristics of a type, period, or method of construction or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction; or

- Criterion D: Has yielded, or may be likely to yield, information important in prehistory or history (36 CFR Part 60).

3.3.3.2 Historical Evaluation per the California Environmental Quality Act

Regulatory compliance in relation to cultural resources is governed by the California Environmental Quality Act (CEQA). CEQA Guidelines define a significant cultural resource as "a resource listed in or eligible for listing on the California Register of Historical Resources (CRHR)" (Public Resources Code section 5024.1). Measures must be considered to reduce or control impacts to identified historic properties affected by a proposed project.

The lead agency can determine that a resource is potentially eligible for listing in the CRHR for the purposes of determining whether a significant impact will occur. Even if the resource is not listed in, or has not been determined eligible for listing in, the CRHR and is not included in a local register of historical resources does not preclude an agency from determining whether a resource may be a historical resource for the purposes of CEQA. A historical resource may be eligible for inclusion in the CRHR if it:

1. Is associated with events that have made a significant contribution to the broad patterns of California's history and cultural heritage;
2. Is associated with the lives of persons important in our past;
3. Embodies the distinctive characteristics of a type, period, region, or method of construction, represents the work of an important creative individual, or possesses high artistic values; or
4. Has yielded, or may be likely to yield, information important to prehistory or history.

In addition, CEQA also distinguishes between two classes of archaeological resources: archaeological sites that meet the definition of a historical resource as above, and "unique archaeological resources." An archaeological resource is considered "unique" if it:

- is associated with an event or person of recognized significance in California or American history or of recognized scientific importance in prehistory;
- can provide information that is of demonstrable public interest and is useful in addressing scientifically consequential and reasonable research questions;
- has a special or particular quality such as oldest, best example, largest, or last surviving example of its kind;
- is at least 100 years old and possesses substantial stratigraphic integrity; or
- involves important research questions that historical research has shown can be answered only with archaeological methods (PRC 21083.2).

The State CEQA Guidelines (14 CCR 15064.5[c]) specify that the lead agency must treat an archaeological resource that meets the definition of a historical resource according to the provisions of PRC 21084.1, 14 CCR 15064.5, and 14 CCR 15126.4. If an archaeological resource does not meet the definition of a historical resource, but does meet the definition of a unique archaeological resource, then the lead agency is obligated to treat the resource according to the provisions of PRC 21083.2 (14 CCR 15064.5[c][3]).

3.4 Hydrologic Resources

The affected environment/environmental setting is summarized from the Groundwater Resources Technical Report in Appendix A and the Surface Water Resources Technical Report in Appendix D.

3.4.1 Groundwater Resources

The Proposed Action includes pumping of up to 15,000 acre-feet per year (AFY) of moderate to high salinity groundwater into two CCID Canals. This water would mix with canal water and subsequently be used for irrigation. Two important parts of the area that would develop the water for transfer are the FCWD, and the Camp 13 Drainage District of the CCID (Figure 1 in Appendix A). Groundwater in most of these two areas has generally not been pumped for direct irrigation use (without mixing), because of the high salinity (often exceeding about 3,000 mg/l of total dissolved solids [TDS]). The wells proposed for pumping would be located between the DMC and Main Canal and Fairfax Avenue and the City of Firebaugh.

Information on regional groundwater conditions in the Mendota-Firebaugh area was provided by Davis and Poland (1957) and Belitz and Heimes (1990). Kenneth D. Schmidt and Associates (1997a) provided a report on groundwater conditions in and near the CCID. Kenneth D. Schmidt and Associates (KDSA 1997b) determined groundwater flows in the San Joaquin River Exchange Contractors service area, which includes most of the areas that would develop the water for transfer.

Information on the groundwater resources in the receiving areas is also presented in this section. The information is summarized from the San Luis Unit Draft EIS (Reclamation 2005c) and the December 2004 Draft EA providing for CVP water service to Santa Clara Valley Water District (Reclamation 2004b).

3.4.1.1 Subsurface Geologic Conditions

Water Development Area

The Corcoran clay is a regional, laterally extensive confining bed beneath much of the west side of the San Joaquin Valley. Regionally, this clay has been used to separate an upper aquifer from an underlying lower aquifer. Groundwater in the upper aquifer is proposed to be pumped as part of the Proposed Action. Based on Figures 1 and 2 of KDSA (1997b), the top of the Corcoran clay is an average of about 350 feet deep and the clay thickens to the west, ranging from about 60 to 100 feet thick, in the majority of the area where the proposed pumpage would take place. Belitz and Heimes (1990) showed that the Sierran Sands are present above the Corcoran clay and below a depth of about 100 feet near the San Joaquin River near Mendota. These deposits are highly permeable and comprise the major aquifer used in the Firebaugh and Mendota areas. These sands become thinner to the west with increasing distance from the San Joaquin River. The sands are overlain by Coast Range alluvial deposits, which are primarily fine-grained in the area where the water would be developed for transfer.

Figure 2 (contained in Appendix A) shows a subsurface geologic cross section, extending from near Brannon Avenue on the west to near Nees Avenue and the Outside Canal on the east. This cross section was developed to focus on conditions above the Corcoran clay in and near the area where the proposed pumping is to occur.

A more localized and thinner confining bed is present along the eastern part of the cross section, and this has been termed the A-clay farther south in the Mendota area. The clay is a lacustrine deposit that is overlain and underlain by the Sierran Sands. Near Firebaugh and Mendota, this blue layer is an important confining bed, partially separating groundwater above average depths ranging from about 50 to 70 feet from the underlying groundwater. Depth to water in wells tapping these sands is typically about 30 to 40 feet along this cross section. The Del Rey well, shown along this section, was developed as a prototype supply well for the proposed project. The perforations in this well extend from 150 to 350 feet deep, and the well taps the lower part of the Sierran Sands, in order to produce water of a suitable quality (with minimal concentrations of selenium and other trace metals) for the Proposed Action. A more detailed description of the cross section is provided in Appendix A.

Water Receiving Areas

Much of the western portion of the San Luis Unit is underlain by the Corcoran clay, which divides the groundwater system into two major aquifers: a confined aquifer below the clay and a semi-confined aquifer above the clay. The groundwater aquifers under the San Luis Unit include three zones of water: (1) a semi-confined zone of water of varying quality; (2) a confined zone of water of varying quality; and (3) a saline body of water underlying the confined zone of freshwater. (Reclamation 2005c)

The semi-confined aquifer can be divided into three geohydrologic units based on the source of sediment: Coast Range alluvium, Sierra Nevada sediments, and flood basin deposit. The Coast Range alluvial deposits are thickest along the western edge of the valley and taper off to the east as they approach the center of the valley floor. These sediments are high in salts and contain a large proportion of silt and clay and elevated concentrations of selenium and other trace elements. The Sierra Nevada sediments on the eastern side of the region are derived primarily from granite rock. These deposits make up most of the total thickness of sediments along the valley axis and gradually thin to the west. These sediments are relatively permeable with hydraulic conductivities three times that of the Coast Range deposits. The floodplain deposits are relatively thin (5 to 35 feet thick) and occur along the center of the valley floor. (Reclamation 2005c)

The three major groundwater basins in the SCVWD service area, which are interconnected and occupy nearly 30 percent of the total county areas, are Santa Clara Valley, Coyote and Llagas Basins. Groundwater supplies nearly half of the total water used in Santa Clara Valley Basin and nearly all of that use is in the Coyote and Llagas basins. In 2000, about 165,000 AF of groundwater was used. (Reclamation 2004b)

Historically, Santa Clara County has experienced as much 13 feet of subsidence caused by excessive groundwater withdrawal. The district was created partially to protect groundwater resources and minimize land subsidence. Subsidence is costly, as it can lead to flooding that damages properties and infrastructure, and saltwater intrusion that degrades groundwater

quality. The rate of subsidence slowed in 1967 when imported water was obtained to replenish groundwater supplies. Today, the SCVWD reduces the demand on groundwater and minimizes subsidence through conjunctive use of surface water and groundwater. The district monitors for land subsidence through benchmark surveying, groundwater elevation monitoring, and data from compaction wells. The SCVWD also monitors groundwater levels to ensure that the amount of groundwater being pumped will not cause further subsidence. (Reclamation 2004b)

3.4.1.2 Types and Depths of Wells

Water Development Area

Few water supply wells have been completed in most of the FCWD and Camp 13 Drainage District because of the poor groundwater quality and the availability of canal water for irrigation. These wells are either deep wells (600 to 710 feet, tapping strata below the Corcoran clay) in the west part of the area that would develop the water for transfer or shallow wells in the east part (180 to 390 feet deep, tapping strata above the Corcoran clay). Wells in the City of Firebaugh and CCID wells in the area are generally less than about 250 feet deep. Better quality groundwater has generally been present between about 100 and 250 feet in depth than in other depth intervals in the east part of the area where the water for transfer would be developed.

Water Receiving Areas

The aquifer system below the Corcoran clay has historically been the most important source of groundwater in the San Luis Unit. Before deliveries from the San Luis Canal began, about 85 to 90 percent of the total groundwater pumpage came from this aquifer system. The groundwater is of relatively good quality and has about 1,100 milligrams per liter of total dissolved solids. (Reclamation 2005c)

The more than 1,000 active irrigation wells reported in the Los Banos-Kettleman City area tap the upper (semi-confined) and lower (confined) freshwater-bearing zones (Miller et al. 1971). The depth of wells into the groundwater reservoir generally decreases from west to east. They range in depth from less than 200 feet near Fresno Slough to more than 1,000 feet in the southwestern part of the area along the west border of the valley. (Reclamation 2005c)

In the western and central parts of the San Luis Unit, most wells tap both the upper and lower water-bearing zones, although many tap only the lower zone because the water quality is better. In the western portion of the San Luis Unit south of Panoche Creek, the deepest wells within the area must generally be drilled to depths of more than 1,200 feet to reach more permeable underlying floodplain and deltaic deposits. In the eastern part of the San Luis Unit, from Tranquility south to the Kings River, the average well depth is 400 to 600 feet, tapping the highly permeable Sierra micaceous sand above the Corcoran clay. The water there was reported to be of good quality. (Reclamation 2005c)

3.4.1.3 Water Levels

Water Development Area

Based on previous water-level information prepared for wells in the Exchange Contractors service area, two time periods were selected as representative: Fall 1981 (normal hydrologic conditions) and Spring 1992 (drought conditions).

Upper Aquifer

In the Fall of 1981, water-level elevations ranged from greater than 130 feet above mean sea level to the southwest to less than 100 feet above mean sea level to the northeast in the upper aquifer. A northeasterly direction of groundwater flow was indicated, into Madera County. Some of the shallow groundwater (above a depth of about 70 feet) in the upper aquifer eventually enters tile drainage systems, including in the FCWD and the CCID Camp 13 Drainage District, and is exported from the area. A relatively small amount (about 1,000 AFY) of groundwater in the upper aquifer in the study area moves downward through the Corcoran clay and into the lower aquifer. Most of the groundwater in the upper aquifer that is not pumped southwest of the San Joaquin River flows into Madera County. Hydraulic gradients generally increase to the northeast toward a large depression cone in southwest Madera County.

Figure 5 (contained in Appendix A) is a water-level hydrograph for Well T12S/R14E-33Q1 (CCID No. 24), located south of the City of Firebaugh. The well is perforated from 75 to 190 feet in depth and thus taps the upper aquifer. During normal and wet periods, depth to water in this well normally ranged from about 10 to 15 feet. However, during the 1987–93 droughts, depth to water was about 15 to 20 feet. Short-term water-level variations were usually less than ten feet. The long-term trend for this well since the late 1970s is one of a stable water level. This is indicated to be a representative trend for the upper aquifer in the area.

Lower Aquifer

Based on maps provided by KDSA (1990b), a groundwater divide was indicated, generally within about two to three miles of the San Joaquin River. Groundwater in the lower aquifer northeast of this divide was flowing to the northeast into Madera County, and groundwater southwest of this divide was flowing to the southwest, into the Panoche and Westlands Water Districts. Few supply wells, in the area where the water for transfer would be developed, tap the lower aquifer; however, many composite wells in southwestern Madera County and most supply wells in the Panoche and Westlands Water Districts tap the lower aquifer. Deeper water-level elevations in some of the composite wells are indicated to be representative of the lower aquifer. Water-level elevations ranged from greater than 70 feet above sea level near the divide to less than 60 feet in Madera County and less than 20 feet in the Panoche and Westland WD in Fall 1981. The source of recharge to groundwater into the lower aquifer is indicated to be downward flow from the upper aquifer. In Spring 1992, the direction of groundwater flow was similar to that in Fall 1981, but water-level elevations were lower in the Panoche and Westlands WD, due to greater pumpage from deep wells at that time compared to in 1981.

In the area where the water for transfer would be developed, head differences between the upper and lower aquifer ranged from about 60 feet near Firebaugh to about 130 feet near the southwest boundary of the FCWD (Figure 6 of KDSA 1997b). These head differences provide the driving force for the downward flow of groundwater through the Corcoran clay to the lower aquifer.

Water Receiving Areas

Groundwater conditions of the San Luis Unit are typified by those of the Westside Sub-basin. This sub-basin consists mainly of lands in Westlands Water District and is located between the Coast Range foothills on the west and the San Joaquin River drainage and Fresno Slough on the east. The sub-basin is bordered on the southwest by the Pleasant Valley Groundwater Sub-basin and on the west by Tertiary marine sediments of the Coast Ranges, on the north and northeast by the Delta-Mendota Groundwater Sub-basin, and on the east and southeast by the Kings and Tulare Lake Groundwater Sub-basins. (Reclamation 2005c)

Primary recharge to the aquifer system is from seepage of Coast Range streams along the west side of the sub-basin and deep percolation of surface irrigation. Flood basin deposits along the eastern sub-basin have caused near surface soils to drain poorly thus restricting the downward movement of percolating water. This restricts drainage of irrigation water and results in the development of irrigation problem areas. (Reclamation 2005c)

Groundwater levels in the Westside Sub-basin were generally at their lowest levels in the late 1960s, prior to importation of surface water. After the CVP began delivery to the San Luis Unit in 1967–68, water levels gradually increased to a maximum in about 1987–88, falling briefly during the 1976–77 drought. Water levels began dropping again during the 1987–92 drought. Through a series of wet years after the drought, 1998 water levels recovered nearly to 1987–88 levels. The fluctuations in water levels illustrate both the importance of CVP deliveries in sustaining groundwater levels and the continuing influence of local and CVP-wide hydrologic conditions on surface water availability and, hence, on groundwater conditions. (Reclamation 2005c)

Westlands Water District, Panoche Water, Pacheco Water District and San Luis Water District and Santa Clara Valley Water District all have approved groundwater management plans, an indication of the districts' involvement in management of their groundwater resources (Reclamation 2005c).

3.4.1.4 Well Production

Water Development Area

Yields of large-capacity wells tapping the upper aquifer in the Firebaugh Mendota area commonly range from about 700 to 2,500 gpm. Table 3.4-1 summarizes pumping rates, drawdowns, and specific capacities for wells in the study area that were pumped for aquifer tests. A transmissivity of 215,000 gpd per foot is considered representative of the upper aquifer in the FCWD and Camp 13 Drainage District.

Table 3.4-1. Well Production and Aquifer Characteristics for Upper Aquifer

Well	Date	Pumping Rate (gpm)	Static Level (ft)	Pumping Level (ft)	Specific Capacity (gpm/ft)	Transmissivity (gpd/ft)
FCWD 11	1/89	2,210	28.9	84.1	39	200,000
CCID 23A	10/96	2,350	15.9	32	141	446,000
CCID 41	10/96	2,210	16.5	89	30	78,000
Snyder	9/02	1,695	29.5	141.8	15	95,000
Del Rey	9/02	2,820	28.7	63.4	81	257,000
City of Firebaugh 14	5/05	1,000	14.0	32.5	54	87,000

Both of the CCID wells and the City of Firebaugh well were pumped for 24 hours. FCWD Well 11 was pumped for 14 days. The Snyder Well was pumped for about 49 days and the Del Rey Well for about 54 days. Transmissivity values are from corrected recovery measurements, except for the FCWD 11 test. FCWD Well data from KDSA (1989), CCID Well data from KDSA (1991a), Snyder and Del Rey Wells data from HydroFocus, Inc. (2003), and City of Firebaugh Well data from KDSA files.

A 14-day leaky aquifer test was conducted on FCWD Well 11 (T13S/R14E-24M1) near Arbios during December 1988-January 1989 (KDSA 1989). This test was done as part of the U. S. Bureau of Reclamation San Joaquin Valley Drainage Program. This well was perforated from 112 to 244 feet in depth and tapped Sierran Sands beneath the A-clay. The results of the leaky aquifer test allowed both the storage coefficient for the upper aquifer and the vertical hydraulic conductivity of the A-clay to be determined. A storage coefficient of 0.001 and a vertical hydraulic conductivity of 0.024 gpd per square foot were obtained. It is expected that with longer pumping (e.g., several months or longer), a higher storage coefficient (about 0.01 or greater) would be obtained.

Water Receiving Areas

Until surface water became available, groundwater was a major source of water supply in the San Luis Unit. Pumping then dropped significantly, except during the drought of 1976–1977, when more than 400,000 AF of groundwater was pumped. Seasonal pumping estimates vary from 80,000 to 700,000 AF, depending on available surface water supplies. (Reclamation 2005c)

3.4.1.5 Groundwater Quality

Water Development Area

Upper Aquifer

The following information is based on KDSA (1999) and KDSA (1997a) and is summarized from Appendix A. The quality of groundwater along the east part of the CCID, in the area where the water for transfer would be developed, is influenced by seepage from the San Joaquin River. In much of this area, groundwater is of relatively low salinity and bicarbonate is the major anion. Because DMC water has been used for irrigation of lands in the FCWD and Camp 13 Drainage District for decades, the quality of this water has influenced groundwater quality. This has been due to canal seepage and deep percolation of irrigation return flow. The latter contributes increased salinity to the groundwater due to concentration

of salts in the applied water by evapotranspiration. Another important factor has been the northeasterly flow of poor quality groundwater in recent decades.

In the area where the water for transfer would be developed, electrical conductivities were lowest (less than 1,000 micromhos) in the area several miles north of Firebaugh near the San Joaquin River (Figure 6, Appendix A). The 2,000 micromhos electrical conductivity contour is several miles to the southwest, near Highway 33 in the area north-west of Firebaugh and near the Main Canal southeast of Firebaugh. In the Camp 13 Drainage District and FCWD, electrical conductivities were higher to the southwest. Along the Outside Canal west of Firebaugh, electrical conductivities ranged from about 3,700 to 6,400 micromhos in 2002 at the Snyder and Del Rey wells. Near the First Lift Canal north of Arbios, the electrical conductivity was about 5,500 micromhos in 1989. These three wells are thus located in the highest salinity area for groundwater in the Sierran Sands. The first two of the wells are in the area where the water for transfer would be developed.

A number of monitor wells have been installed in the area that would develop the water for transfer by the Exchange Contractors, Westland WD, Broadview WD, and other entities. TDS concentrations were about 11,000 mg/l in groundwater at a depth of about 50 feet at FC-7, near Nees Avenue and the DMC. A TDS concentration of 9,900 mg/l was found in groundwater from a depth of about 50 feet at FC-6, near Herndon Avenue, between the Second and Third Lift Canals. This groundwater is present in oxidized Coast Range deposits above the Sierran Sands, and also contains significant selenium concentrations. That is, selenium concentrations exceeded the drinking water standard and fish and wildlife water quality criteria.

Table 3.4-2 provides a summary of inorganic chemical analyses of water from the Snyder, Del Rey, and FCWD No. 11 wells. Each of these wells was pumped for an extended period to help determine the impact of pumping groundwater from the Sierran Sands on shallow groundwater levels.

Table 3.4-2. Chemical Quality of Water From Selected Wells

Constituents (mg/l)	Snyder	Del Rey	FCWD 11
Calcium	110	230	335
Magnesium	79	160	200
Sodium	600	1,100	1,235
Potassium	8	14	8
Carbonate	-	-	<10
Bicarbonate	190	230	226
Sulfate	730	1,500	2,980
Chloride	740	1,400	775
Nitrate	-	-	<0.4
pH	7.5	7.3	7.9
Electrical Conductivity (micromhos @ 25˚C)	3,745	6,400	7,100
Total Dissolved Solids (@ 180˚C)	2,400	4,300	5,525
Boron	1.6	2.0	0.8
Arsenic	0.001	0.016	-
Molybdenum	0.011	<0.005	-

Table 3.4-2. Chemical Quality of Water From Selected Wells

Constituents (mg/l)	Snyder	Del Rey	FCWD 11
Selenium	<0.0004	<0.0004	<0.005
Date	8/28/02	8/28/02	12/89
Perforated Interval (ft)	150-230	150-350	112-247

Analyses for the Snyder and Del Rey Wells are by BSK Analytical Laboratory in Fresno and are from HydroFocus, Inc. (2003). Analyses for FCWD Well 11 is from KDSA (1989) and was by BC Laboratories, Inc. of Bakersfield. The FCWD well is south of the area proposed for pumping for this project. Somewhat lower TDS concentrations can be obtained through selective perforating and sealing of new wells.

Groundwater with a TDS concentration of about 2,500 mg/l can be obtained for the project in the area by selective perforating and sealing of strata when the new wells are constructed.

Lower Aquifer

Information on the inorganic chemical quality of groundwater below the Corcoran clay is available for five test wells and one deep cluster monitor well at the Mendota Airport (KDSA 1999). TDS concentrations ranged from about 600 to 1,660 mg/l. The lowest TDS concentration was found at a city test well about a mile east of the Fresno Slough, south of the San Joaquin River. The TDS concentrations in water from the samples collected from below the Corcoran clay in the remaining test wells or monitor wells were 1,000 mg/l or higher. Sulfate concentrations ranged from 115 mg/l to 600 mg/l in water samples from below the Corcoran clay. Sulfate concentrations in three of four wells sampled for this constituent exceeded the recommended MCL of 250 mg/l. Chloride concentrations in samples from below the Corcoran clay ranged from 89 to 322 mg/l, and exceeded the recommended MCL in water from two of the wells.

A number of DMC pumpers' wells are located along the DMC near Russell Avenue, and tap strata below the Corcoran clay. Several additional deep wells are located farther east, between Brannon and Fairfax Avenue. Chemical analyses provided by the CCID indicated that these wells have produced water with electrical conductivities ranging from about 1,600 to 1,800 micromhos (equivalent to about 1,100 to 1,200 mg/l of TDS). The salinity of this groundwater thus is similar to that in the area near Mendota.

Water Receiving Areas

During the past 40 years, recharge increased dramatically as a result of imported irrigation water. Irrigated agriculture has altered both groundwater flow and quality. Percolation of irrigation water past crop roots, pumpage of groundwater from deep wells, and imported surface water used for irrigation have combined to create large downward hydraulic-head gradients. The salts in the irrigation water, and soil salts leached from the unsaturated zone, increased salt and selenium concentrations in groundwater. In low-lying areas of the valley, and where the water table is within seven feet of land surface, evaporation from the shallow water table further increase salt and selenium concentrations. (Reclamation 2005c)

Soil salts in the San Luis Unit contain calcium, sulfate, sodium, magnesium and inorganic carbon. Prior to irrigation, soils contained sodium, magnesium, sulfate evaporite salts such as thenardite (sodium sulfate), mirabolite (sodium sulfate) and bloedite (magnesium, sodium

sulfate) and calcium sulfate (gypsum) and calcium carbonate. Irrigation dissolves the more soluble evaporite salts and substantial amounts of calcite (calcium carbonate) and gypsum (calcium sulfate) remain in irrigated soils. Presser et al. (1990) reported selenium concentrations ranging from 1 to 25 ppm in these evaporite salts present in the saline and seleniferous geological formations in the Diablo Range and in unirrigated soils. In contrast, Deverel and Fujii (1988) reported that selenium is probably not present in gypsum. Irrigation of saline soils dissolved soluble soil salts and selenium and moved them to the groundwater. Subsequent rises in the groundwater table further increased groundwater salinity and selenium concentrations. (Reclamation 2005c)

A USGS report (Dubrovsky and Deverel 1989) indicated that irrigation had affected the upper 20 to 200 feet of the saturated groundwater zone. This poor quality groundwater zone is moving downward in response to recharge from above the water table and pumping from deep wells. In 1994 Belitz and Phillips estimated the downward velocity of the poor quality groundwater at about 0.6 foot/year, which suggests that most of the region's groundwater would be affected within 200 to 930 years. Based on an analysis of groundwater quality in subregions, Quinn et al. (1990) estimated that the useable average life of the aquifer in Westlands was from 110 to 114 years. (Reclamation 2005c)

Total Dissolved Solids

Groundwater zones commonly used along a portion of the western margin of the San Joaquin Valley have high concentrations of total dissolved solids, ranging from 500 mg/l to greater than 2,000 milligrams per liter. The concentrations in excess of 2,000 milligrams per liter commonly occur above the Corcoran clay layer. These high levels have impaired groundwater for irrigation and municipal uses in the western portion of the San Joaquin Valley. Contractors in the San Luis Unit with drainage-impacted lands have developed aggressive programs to manage salts in the root zone and to minimize deep percolation through the use of high-efficiency irrigation techniques, such as sprinklers, shortened rows, and the installation of groundwater monitoring wells. (Reclamation 2005c)

Beneath the shallow groundwater, a change occurs in the chemical composition of the dissolved solids. The groundwater in the upper semi-confined aquifer generally contains high concentrations of calcium, magnesium, and sulfate. As depth increases toward the Corcoran clay, the total dissolved solids decline and the percentage of sodium increases. The confined aquifer below the Corcoran clay contains predominantly sodium-sulfate water. Groundwater immediately above and below the Corcoran clay is fresh enough for irrigation use. The saline waters underlying the confined aquifer at depths ranging from 800 to 1,500 feet are predominantly affected by sodium chloride salts. (Reclamation 2005c)

Selenium

Selenium occurs naturally in soils and groundwater on the west side of the San Joaquin River Region. Selenium concentrations in shallow groundwater along the west side of the region have been highest in the central and southern area south of Los Banos and Mendota with median concentrations of 10,000 to 11,000 micrograms per liter. (Reclamation 2005c)

The Draft EIS for the San Luis Unit Drainage Feature Re-evaluation reports minimum and maximum selenium concentrations of less than 1 and 21 micrograms per liter, respectively, above the mouth of the Merced River and 0.1 and 23 micrograms per liter below. Use of groundwater to support aquatic species is impaired by the elevated selenium concentrations between Los Banos and Mendota in the western San Joaquin River Region. (Reclamation 2005c)

Other Contaminants

Boron, molybdenum, and arsenic are also among the elements of primary concern. Elevated concentrations of vanadium, chromium, and mercury have also been observed in the shallow groundwater in the San Luis Unit. (Reclamation 2005c)

3.4.1.6 Existing Monitoring in Water Development Area

Canals

According to the CCID, flows in the Main Canal are measured at the headworks and at a point about three miles downstream. Flows in the Outside Canal are measured at the headworks and near Sierra Avenue. Extensive water quality monitoring is done at the headworks of both canals, where continuous electrical conductivity recorders are operated (Luhdorff and Scalmanini and KDSA 2005). Periodic sampling of canal water for irrigation suitability and selenium analyses is conducted at the headworks. The CCID also collects monthly samples from 12 sites along the Main and Outside Canals for determination of electrical conductivity, boron, and selenium (analyzed by BSK Analytical Laboratory of Fresno). Once a year, water samples are collected at these locations for irrigation suitability analyses by BSK. One of these sites is at the Main Canal and Russell Avenue, and another is at the Outside Canal and the Panoche Bypass.

Shallow Observation Wells

Shallow observation wells, in the area where the water for transfer would be developed, are generally about 10 to 20 feet deep and are located near section corners. They are thus about a mile apart from each other. The CCID measures water levels in these wells in the Camp 13 Drainage District three times a year (spring, summer, and fall). If enough water is present for sampling, a hand pump is used to collect a water sample. The samples are analyzed by CCID for electric conductivity and boron. For shallow wells in the FCWD, water levels are also measured three times a year.

Drain Sumps

Summers Engineering of Hanford oversees monitoring of drain sumps in the area. There are nine drainage sumps within the Camp 13 Drainage District. These sumps accumulate water from the sub-surface tile systems adjacent to the sumps. The sumps discharge into a collection system which ultimately discharges into the Main Drain, located just south of the Main Canal. The water then flows westerly into the Grassland Bypass or into the San Joaquin River Quality Improvement Project reuse area. All of these sumps have flowmeters, which are read weekly. Water quality samples are collected approximately monthly and are analyzed for electrical conductivity, selenium, and boron.

CCID Wells

Static water levels are measured in District wells in the spring and fall of each year. Flowmeters are installed on each well to measure pumpage and are read on a monthly basis during pumping episodes. Water samples are normally collected from active District wells annually in the summer for irrigation suitability analyses.

A small portion of the drainwater from FCWD sumps can be recycled within the District. Eighteen sumps can discharge into the Grassland Bypass, similar to the Camp 13 sumps.

Subsidence

The Russell Avenue recorder is operated by the San Luis and Delta-Mendota Canal Water Authority. The Yearout Ranch recorder is operated by the CCID. Land surface elevations and compaction are continuously measured at these two recorders. The Fordel compaction recorder is operated by the Mendota Pool Group. Annual reports prepared by Luhdorff and Scalmanini and KDSA on the MPG pumping program provide information on the subsidence monitoring near Mendota.

3.4.1.7 Regulation of Groundwater Resources

The Groundwater Management Act of 1992 (AB 3030) applies to groundwater usage by the Exchange Contractors. This act establishes a voluntary program whereby local water agencies may establish programs for managing their groundwater resources. The Exchange Contractors adopted a Groundwater Management Plan in October 1997 (Exchange Contractors 1997). The plan commits the Exchange Contractors to keeping records of groundwater pumping and conducting periodic monitoring of groundwater levels and quality throughout their service area.

Fresno County regulates the extraction and transfer of groundwater within the county under Title 14, Chapter 3 of the Fresno County Ordinance Code. Fresno County and the Exchange Contractors have a Memorandum of Understanding (MOU) that exempts the Exchange Contractors from regulation of groundwater resources within Fresno County. Fresno County and the Exchange Contractors agree that agricultural production is vital to the county and that groundwater, used conjunctively with surface water, is essential for continued agricultural production. The MOU specifically exempts the Exchange Contractors from the newly adopted Title 14, Chapter 3 of the Fresno County Ordinance Code, in accordance with Section 14.03.05E of the code. Fresno County recognizes that the Exchange Contractors' management, protection, and control of groundwater resources are consistent with Title 14, Chapter 3; therefore, the MOU exempts the Exchange Contractors from this code requirement. (Fresno County and Exchange Contractors 2001)

3.4.2 Surface Water Resources

3.4.2.1 Water Development Area

The information in this section is summarized from Appendix D, Surface Water Resources Technical Report and the *Draft Environmental Impact Statement San Luis Unit Long-Term Contract Renewal* (Reclamation 2005c). The Exchange Contractors hold historic water rights to the San Joaquin River. Their service area is located on the west side of the San Joaquin

Valley (see Figure 2-2). In exchange for the regulation and diversion of the San Joaquin River at Millerton Lake (Friant Division), Reclamation agreed to supply water to the Exchange Contractors from the CVP's Delta supply. The substitute water amounts to a supply not to exceed 840,000 AFY in accordance with monthly and seasonal maximum entitlements. During years defined as critical the annual supply is not to exceed 650,000 AF.

The Exchange Contractors provide water deliveries to over 240,000 acres of irrigable land on the west side of the San Joaquin Valley, spanning a distance roughly from the town of Mendota in the south to the town of Crows Landing in the north. The four entities of the Exchange Contractors each have separate conveyance and delivery systems operated independently although integrated within a single operation for performance under the exchange contract. These conveyance and delivery systems generally divert water from the CVP's Delta-Mendota Canal and Mendota Pool, convey water to customer delivery turnouts, and at times discharge to tributaries of the San Joaquin River. Deliveries include the conveyance of water to wildlife areas.

Groundwater is used to supplement the Exchange Contractors' CVP substitute water supply and to provide delivery capacity. Groundwater is also being used to improve the operational control of distribution systems. Currently, the Exchange Contractors have an active program to capture tailwater and redirect it to distribution canals.

Deliveries are made to the Exchange Contractors from the Delta-Mendota Canal, Mendota Pool, and from releases from Mendota Pool into the San Joaquin River and diverted into the Exchange Contractors' delivery system at Sack Dam. Depending on the Exchange Contractor entity, water is either delivered to community ditch systems of the customers from the main canal systems or water is further conveyed through entity-owned and maintained community ditch systems to ultimate points of delivery. Once delivered, the entities lose control of the water until the farmers' surface runoff, if any, is intercepted by district facilities.

Individual farmers may operate tailwater recovery systems and reuse the water on their farms. The water that ultimately escapes the customers' on-farm systems is intercepted and reused by the Exchange Contractors tailwater recovery program. Some drainage exits the Exchange Contractors service area to Salt and Mud Sloughs.

The areas that would develop the water for transfer are within CCID, including the Camp 13 Drainage Area, and FCWD. The Proposed Action would involve the development of new and existing wells adjacent to the CCID Main and Outside Canals, and the DMC. Pumping from the wells would blend into the canal supply and be delivered downstream. Entities receiving deliveries from CCID would experience no change in water supply, except potentially a change in the water quality of their supply.

CCID diverts water from the Mendota Pool into the Main and Outside Canals. CCID also receives deliveries from the DMC to the Outside Canal at Milepost 76.05. Both the Main and Outside Canals divert water on a pattern generally representative of seasonal irrigation requirements. Table 3.4-3 illustrates the recent 3-year diversions to the Main and Outside Canals by CCID. These diversions are influenced by CCID deliveries to its customers and by conveyance of water to other entities. During the peak irrigation season (June to August), diversions to the Main Canal can range between 1,000 cubic feet per second (cfs) and 1,800 cfs, and at the Outside Canal range between 350 cfs and 500 cfs.

Table 3.4-3. CCID Diversions to Main Canal and Outside Canal at Mendota Pool

TAF	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Main Canal													
2003	5.5	32.3	23.2	15.8	29.4	61.0	74.3	68.8	51.1	35.1	11.3	0.0	407.8
2004	1.5	24.2	26.9	25.3	49.1	55.2	66.3	50.5	33.2	37.9	11.7	2.0	383.7
2005	7.0	16.7	12.7	19.3	32.7	54.6	70.5	63.7	36.9	35.0	15.8	0.0	364.9
Outside Canal													
2003	0.3	8.1	9.9	7.6	10.8	15.6	16.9	16.2	14.2	14.4	4.5	0.0	118.6
2004	1.3	6.1	7.4	8.0	10.2	0.0	12.7	16.0	10.2	11.8	5.9	1.0	90.6
2005	2.0	3.9	14.3	5.5	15.0	23.4	24.2	22.7	21.6	15.6	8.9	0.0	156.9

The quality of water available at the headworks of the canals is typically indicative of water delivered from the DMC to the Mendota Pool (Check 21). The exception to this condition is when Tulare Lake Basin flows arrive through Fresno Slough or when flow is available from the San Joaquin River. The historical record of water quality at Check 21 and at Check 13 (below the mixing of DMC and San Luis Unit water) was reviewed and analyzed by year type to provide the water quality parameters described in Table 3.4-4, which represent the historical water quality diverted to the Main and Outside canals by year type.

Table 3.4-4. Generalized Water Quality Diverted to Main Canal and Outside Canal at Mendota Pool (DMC source)

EC - uS/cm	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Mendota Pool												
Wet	500	500	500	460	470	407	334	364	391	398	500	532
Above Normal	550	550	542	463	471	450	355	373	391	491	552	623
Below Normal	556	551	544	469	475	450	365	379	475	537	560	630
Dry	650	615	620	553	480	450	370	485	610	599	572	630
Critical	732	760	814	889	882	766	785	693	699	690	742	780

Water is also delivered to the Outside Canal at DMC milepost 76.05 (Wolfsen Bypass). Water diverted at the Wolfsen Bypass from the DMC will flow both downstream and upstream in the Outside Canal. The recent 3-year diversions at the Wolfsen Bypass are shown in Table 3.4-5, with the water quality of DMC Check 13 shown in Table 3.4-6.

Table 3.4-5. CCID Diversion to Outside Canal from Wolfsen Bypass (DMC Milepost 76.05)

TAF	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Milepost 76.05													
2003	5.9	8.5	9.0	3.8	20.9	19.1	28.1	22.8	19.9	7.0	7.1	12.1	164.1
2004	10.3	4.9	9.1	8.9	23.1	23.2	27.9	20.4	11.1	11.4	2.0	11.6	164.0
2005	2.0	2.5	5.8	5.1	6.9	15.1	24.6	23.2	16.3	14.4	9.6	12.3	137.8

Table 3.4-6. Generalized Water Quality Diverted to Outside Canal (DMC Milepost 76.05)

EC - uS/cm	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Mendota Pool												
Wet	383	370	357	346	298	278	244	271	274	317	406	453
Above Normal	500	507	440	420	438	337	274	289	355	478	528	618
Below Normal	535	546	510	450	443	404	310	356	461	518	540	628
Dry	575	584	586	499	457	409	333	459	582	584	556	630
Critical	588	638	700	642	565	541	564	576	624	600	577	636

Water diverted at Mendota Pool to the Outside Canal is depleted by deliveries along its downstream path. Local inflows will also occur to the canal from groundwater pumping supplies, surface tailwater recaptured by relift pumps, and minor drainage pumping. Water will continue to flow downstream to the O'Banion Bypass where it can be bifurcated to continue flowing downstream in the Outside Canal and/or be diverted to the Main Canal. Under normal conditions flow will continue only a short distance downstream past the O'Banion Bypass. At that location, the remainder of the Outside Canal's demands is met with diversions through the Wolfsen Bypass.

Water diverted at Mendota Pool to the Main Canal is also depleted and supplemented downstream. Deliveries will typically be met from Mendota Pool diversions through a location at the O'Banion Bypass. Northward from that point deliveries will be met with the remaining flow in the Main Canal and from flow originating from the Outside canal either from Mendota Pool or from DMC flows routed through the O'Banion Bypass. In the local area along the Main Canal, deliveries are made to numerous community ditches, Grassland Water District, and others that receive water through the conveyance of CCID.

3.4.2.2 Water Receiving Areas

Surface water supply deliveries to the CVP contractors in the San Luis Unit and Santa Clara Valley Water District are influenced by:

- Hydrology and storage upstream
- Operations in the Delta, including consideration for Endangered Species Act (ESA) compliance and other instream needs
- Legislated processes
- Implementation of water management programs or project to increase CVP yield
- Water quality standards in the Delta to meet established water quality objectives

The management of San Luis Unit facilities is substantially influenced by the management of the northern CVP facilities. About half of the CVP's annual water supply is delivered through the Delta-Mendota Canal and San Luis Unit facilities. To accomplish the objective of providing water to CVP contractors in the San Joaquin Valley, four conditions must be considered (Reclamation 2005c):

- Water demands for CVP water service contractors and exchange contractors must be determined.
- A plan to fill and draw down San Luis Reservoir must be made.
- Plans for the coordination of Delta pumping and San Luis Reservoir operations must be established.
- Project operations must conform to environmental objectives to support fisheries and maintain water quality in the San Joaquin River.
- The CVP operation of the San Luis Unit requires coordination with the SWP because some of the facilities are joint Federal-state facilities. Similar to the CVP, the SWP also has water demands it must meet with limited water supplies and facilities. Coordinating the operations of the two projects avoids inefficient situations (for example, one entity pumping water into San Luis Reservoir while the other is releasing water).

The total San Luis Unit annual water supply is contingent on coordination with the SWP's needs and capabilities. When the SWP excess capacity is used to support CVP by the use of a joint point of diversion, it may be of little consequence to SWP operations, but extremely critical to CVP operations. The availability to the CVP of excess SWP capacity is contingent on the SWP's ability to meet its SWP contractors' water supply commitments. Additionally, close coordination by the CVP and SWP is required to ensure that water pumped into O'Neill Forebay does not exceed the CVP's capability to pump into San Luis Reservoir or into the San Luis Canal at the Dos Amigos Pumping Plant. (Reclamation 2005c)

During spring and summer, water demands generally exceed the capability to pump water at CVP and SWP project facilities, and water stored in San Luis Reservoir is used. Because the reservoir has very little natural inflow, water is stored there when the Tracy and Banks Pumping Plants can export more water from the Delta than is needed for contracted water needs. (Reclamation 2005c)

San Luis Unit Facilities

The San Luis Unit is part of the West San Joaquin Division of the CVP and also part of the State of California Water Plan. The principal Federal facilities of the San Luis Unit include four storage dams that form reservoirs with a total active capacity of 2,013,370 AF, 115 miles of canals, 1.8 miles of tunnels, 26 pumping plants, 84 miles of drains, two pumping-generating plants, and three substations. (Reclamation 2005c)

Reclamation constructed this unit, certain facilities of which are operated jointly by Reclamation and the State of California. Of the joint-use facilities, 55 percent of the total cost is attributed to the State of California and the remaining 45 percent to the United States. The joint-use facilities are O'Neill Dam and Forebay, B.F. Sisk (San Luis) Dam, San Luis Reservoir, William R. Gianelli Pumping-Generating Plant, Dos Amigos Pumping Plant, Los Banos and Little Panoche Reservoirs, and San Luis Canal from O'Neill Forebay to Kettleman City, together with the necessary switchyard facilities. (Reclamation 2005c)

The Federal-only facilities that are within the San Luis Unit include the O'Neill Pumping Plant and Intake Canal, Coalinga Canal, Pleasant Valley Pumping Plant, and San Luis Drain. San Luis Reservoir serves as the major storage reservoir and the O'Neill Forebay acts as an

equalizing water basin for the upper stage, dual-purpose pumping-generating plant. Pumps located at the base of O'Neill Dam take water from the Delta-Mendota Canal through an intake channel (a Federal feature) and discharges it into the O'Neill Forebay. The California Aqueduct (a state feature) flows directly into O'Neill Forebay. The Gianelli pumping-generating units lift the water from the O'Neill Forebay and discharge it into San Luis Reservoir. When not pumping, these units generate electric power by reversing flow through the turbines. Water for irrigation is released into the San Luis Canal and flows by gravity to Dos Amigos Pumping Plant, where it is lifted more than 100 feet to permit gravity flow to its terminus at Kettleman City. During irrigation months, water from the California Aqueduct flows through the O'Neill Forebay into the San Luis Canal instead of being pumped into the San Luis Reservoir. Two detention reservoirs, Los Banos and Little Panoche Reservoirs, control cross drainage along the San Luis Canal. The reservoirs provide recreation and flood control benefits. (Reclamation 2005c)

Natural Watercourses in the San Luis Unit

San Luis Unit surface waters originate in the western San Joaquin Valley and flow predominantly eastward towards, and contributory to the San Joaquin River as direct surface flows or as contributions to east-trending groundwater flows. The San Joaquin River provides the major drainage outlet from the San Joaquin Valley. The San Joaquin River flows north along the valley trough and converges with the southerly flowing Sacramento River in the Sacramento-San Joaquin Bay-Delta. From there the water flows through the Suisun Bay and Carquinez Strait into San Francisco Bay and out to the Pacific Ocean. Water supply for purposes other than drinking water is mainly derived from runoff from the mountains and foothills of the Coast Ranges and the Sierra Nevada foothills. The primary use of surface water in the area is for agriculture. Surface water supplies have been developed by local irrigation and water districts, county agencies, private companies, and state and Federal agencies. (Reclamation 2005c)

Flows in the San Joaquin River are controlled mostly by dams on east-side tributaries and on the main stem upstream of Fresno. Water supply developments on the major east-side tributaries have reduced the San Joaquin River flow (SJVDP 1990). Major contributors of flow to the San Joaquin River include upstream flows in the San Joaquin River above the Salt Slough confluence, Salt and Mud sloughs, the major west side tributaries of the San Joaquin River, and the Merced River. By far the largest of these sources is the Merced River, which accounts for 50 to 75 percent of the flow of the San Joaquin River measured at Crows Landing. Releases from Friant Dam located on Millerton Reservoir upstream from the drainage area are not generally a major source of flow at Crows Landing except during flood releases. (Reclamation 2005c)

There are 18 separate named arroyos[1] and creeks originating in the Coast Range that flow westward into and/or across San Luis Unit, but rarely reaching the San Joaquin River. Much

[1] The 11 named arroyos (and creeks) are fed by several other ephemeral and intermittent tributaries in the uplands of the Coast Range hills located west of the San Luis Unit. They total 80 miles in length, and include Surprise Arroyo, and Arroyos Chico, Doblegado, Finito, Hondo, Largo, Larguito, Pequeno, Robador, Seco, and Somero. Silver Creek above its confluence with Panoche Creek is not within the San Luis Unit until its flows have merged with those of Panoche Creek.

of the flow of these arroyos and creeks is intermittent, typically resulting in little or no flow in the late summer and early fall months. The seven major creeks total approximately 267 miles in length, ranging from Little Panoche Creek (24 miles long) to Los Banos and Los Gatos Creeks, each of which is approximately 73 miles long. Silver Creek joins Panoche Creek at a confluence west of the San Luis Unit. (Reclamation 2005c)

Santa Clara Valley Water District Facilities

SCVWD owns and operates eleven storage reservoirs with a combined storage capacity of 170,000 AF. These reservoirs are located on most of the major streams in the SCVWD service area. These reservoirs retain seasonal runoff that can later be released for groundwater recharge along natural channels and in percolation ponds. Local surface water supplies include the streams flows that feed into and out of the SCVWD's reservoirs, stream flows that are not captured by reservoirs, and water that flows overland into reservoirs. SCVWD owns and operates 17.3 miles of canals, 8.4 miles of tunnels, 142 miles of pipelines, 3 pumping station and 3 treatment plants as part of the overall water treatment, distribution and recharge systems. SCVWD also operates twelve water storage reservoirs (11 are owned by SCVWD). (Reclamation 2004b)

3.5 Land Use

This section describes the physical land resources and relevant county general plan policies in the project area, including the water development and water receiving areas. It also defines Indian Trust Assets (ITAs).

3.5.1 Land Use Resources

The area for water development lies entirely within Fresno County. The primary land use in the water development area is agriculture, consisting mostly of cotton, alfalfa hay and seed, melons, vegetables, and grains. A description of land uses in the receiving areas of the proposed water transfer project is provided in Reclamation's long-term contract renewal NEPA documents for the San Luis Unit and San Felipe Division of the CVP (Reclamation 2005 and Reclamation 2004b) and is summarized in this document.

3.5.1.1 Water Development Area

Land in farms consists primarily of agricultural land used for crops, pasture, or grazing. Agricultural land can be either irrigated or used for cropland. Irrigated land is land to which water is artificially applied for producing a harvested crop, for pasture or grazing lands, for cultivated summer fallow, or for land planted with a crop intended for future harvest (Reclamation 2004a). Cropland consists of land that could have been used for crops without additional improvements. Table 3.5-1 shows the irrigated acreage in the CCID and FCWD service areas.

Table 3.5-1. Irrigated Acreage by Agricultural Area

Area/District	Total Acreage in Service Area[1]	Irrigated Acreage[2]
CCID	152,691	147,254
FCWD	21,731	20,739

[1] Information from the State Water Resources Control Board, Report No. 64-1, Kc Values. Information for agricultural water users provided by individual districts to Exchange Contractors, January 2000 (Reclamation 2004a).

[2] Information from the State Water Resources Control Board, Report No. 64-1, Kc Values. Information provided by Reclamation for either an average of years or as best available data (Reclamation 2004a).

Agricultural lands in California may be protected under the California Land Conservation Act, commonly called the Williamson Act. Local governments can enter into contracts with private landowners for the purpose of restricting specific parcels of land to agricultural or related open space use. Landowners receive substantially reduced property tax assessments in return for enrollment under Williamson Act contracts. Property tax assessments of Williamson Act-contracted land are based on the generated income of the land as opposed to the potential market value of the property (DLRP 2004, Reclamation 2004a). Fresno County has approximately 39.65 percent Williamson Act-contracted land (CSAC 2004, Reclamation 2004a).

Fresno County also contains Prime Farmlands (731,000 acres), Unique Farmlands (103,000 acres), and Farmland of Statewide (490,000 acres) and Local (74,000 acres) Importance (FSI and FLI) (Reclamation 2004a). As defined by the U.S. Department of Agriculture, Prime Farmlands consist of soils that are best suited to producing food, seed, forage, fiber, and oilseed crops. Such soils have properties that are favorable for the production of sustained high yields of crops. Unique Farmlands include land used for production of the state's major crops on soils not qualifying for prime or statewide importance. This land is usually irrigated, but may include non-irrigated fruits and vegetables as found in some climatic zones in California. No specific statewide criteria for FSI or FLI are available other than the lands must have been irrigated within the past three years and have a good combination of physical and chemical features, but have minor shortcomings such as greater slopes or with less ability to hold and store moisture. FSI and FLI lands include those lands of agricultural importance to the local economy, as defined by each county's local advisory committee and adopted by its board of supervisors. Figure 7-1 (contained in Reclamation 2004a) shows the different farmland designations.

There are wildlife refuges adjacent to CCID and FCWD. These wildlife refuges offer recreational opportunities, primarily designed to enhance hunting and wildlife observation opportunities. Most recreational opportunities are associated with waterfowl and include both nonconsumptive uses (wildlife observation and hiking) and consumptive uses (hunting). Major recreational opportunities in the San Joaquin Valley include fishing, boating, camping, wildlife observation, and reservoir boating and fishing.

The hunting of ducks, geese, and pheasants is permitted between October and January in portions of each refuge and in Los Banos Wildlife Management Area (WMA). Fishing is permitted at San Luis National Wildlife Refuge (NWR) and Los Banos WMA. San Luis and Merced NWRs provide self-guided tours, and camping is permitted at the staging areas

during hunting season. Camping is also permitted at Los Banos WMA in the parking lots, and the management area is open to hiking and bike riding all year. Special blind access sites are available for mobility-impaired hunters at the Los Banos and Mendota WMAs.

In 1992, combined recreation use at the wildlife refuges and management areas totaled approximately 56,000 5-hour recreation visitor days. The most popular activities were nonconsumptive uses, such as wildlife viewing. Between 1985 and 1990, nonconsumptive uses accounted for approximately 69 percent of total use, hunting accounted for approximately 22 percent, and fishing accounted for the remaining 9 percent. An estimated 15 percent of the visitors to the refuges originate in the local area. (Reclamation 1997)

Most visitations to the wildlife refuges and management areas occurs during winter when the waterfowl are present. Approximately 45 percent of the total use occurs between October and January. The June through August period accounts for approximately 20 percent of total use. All hunting occurs between October and January, and fishing occurs year-round. (Reclamation 1997)

3.5.1.2 Water Receiving Areas

The following discussion provides information on land uses within each contractor's service area who may participate in the water transfer and includes a discussion of current agriculture and future trends in agriculture as applicable. It also includes a discussion of current land use planning and development projects.

Pacheco Water District

The Pacheco Water District is located near the City of Los Banos in both Merced and Fresno counties. Pacheco Water District, a small, entirely agricultural district, has fewer than 10 landowners. The principal crops grown in this district include melons, tomatoes, asparagus, and a small amount of alfalfa. Panoche Water District assumed the management responsibilities of Pacheco Water District in 1999. There is no planned development in Pacheco Water District, which is expected to remain an entirely agricultural district. (Reclamation 2005c)

Panoche Water District

The Panoche Water District is located in both Merced and Fresno counties. Panoche Water District is primarily an agricultural district. M&I water use is incidental to agricultural use and amounts to less than 50 AFY. M&I use is not expected to increase because it is not anticipated that agricultural land would be converted to other land uses (Reclamation 2005c).

There are approximately 65 water users in the district, which includes 60 landowners. The largest landowner farms approximately 9,000 acres, while the smallest landowner farms less than 20 acres. The landowner base in the district has remained very stable, with the majority of the landowners having been there since the 1940s and 1950s. Approximately 26 percent of the land is leased out; the remaining land is farmed directly by the landowners. The district also participates in an active drainage management program that reduces drain water volumes and constituent loads by altering cropping patterns and/or irrigation methods in targeted areas. Primary crops produced in the district in 1997 included cotton, processing or cannery tomatoes, melons and alfalfa hay. Despite the district's participation in the active

management program, the production of these crops is expected to continue. (Reclamation 2005c)

San Luis Water District

The San Luis Water District is located near the City of Los Banos and is within both Merced and Fresno Counties. The southern section of the district located in Fresno County is primarily agricultural. The land is planted with either row crops, including cotton and melons, or permanent crops, including primarily almonds. In recent years, some parcels in this area of the district have not been farmed because they are of marginal quality or have high water costs or drainage problems. (Reclamation 2005c)

CVP water is used for both agricultural and M&I uses. M&I use primarily occurs in the northern section of the district, which is located in Merced County. It is anticipated that the conversion from agricultural use to M&I use will occur mostly in this section of the district. Approximately 10,000 acres identified as potential development locations are currently in the planning stages with Merced County and the district.[2] Recent development trends include the construction of a commercial development in 1996 and the approval of a 65-home subdivision and a 392-acre golf course and subdivision. Much of the land targeted for M&I development is currently unused and desolate. All development proposals including the Villages will be subject to separate analysis under the California Environmental Quality Act (CEQA) and planning policies, ordinances, and regulations administered by Fresno and Merced Counties, as appropriate and consistent with their respective levels of jurisdiction. (Reclamation 2005c)

Westlands Water District

Westlands Water District is located in western Fresno and Kings Counties. Agricultural production is the predominant land use, because farmers in the district work fertile and productive land, producing food and fiber products and economic wealth. More than 60 different crops are grown commercially in Westlands Water District, with the potential for many others. The primary crops grown include cotton, tomatoes, garlic, almonds, melons, lettuce, grains and safflower. The cropping patterns have changed over the years depending upon water availability, water quality, and the agricultural economy and market factors. Prior to the delivery of CVP water, farmers in Westlands Water District grew primarily cotton and grain along with some vegetables. The acreage trend, however, is that vegetable and permanent crops have become a larger part of the crop acreage and cotton and grain acreage has decreased. Since 1977, approximately 8.8 percent of the land in the district, on average, is idle each year. Since 2000, water supply reductions have resulted in increased land fallowing in the Westlands Water District. Approximately 100,000 acres were fallowed in 2002. By 2001, a total of 2,091 acres in Westlands Water District had been retired from commercial irrigation. (Reclamation 2005c)

[2] It is the San Luis Water District's policy to ensure that development does not jeopardize other water users within the district. Therefore, any potential developer must prove that a dependable long-term water supply can be secured to meet the water needs of the project before that project can be approved for development. In this analysis, the development under consideration must assume that the district receives only 25 percent of its CVP water supply. This percentage is based on the allocations received by the District in 1991 and 1992.

Unlike many other key growing areas of California, urbanization is not a direct threat to productivity. However, CVP water in the district is used for both agricultural and M&I uses. The majority of CVP supply is used in agriculture, and of the almost 800 water users in the district, approximately 600 are agricultural users and approximately 180 are M&I users. The district's M&I deliveries include cities and governmental agencies; however, none of this water is treated by the district before its distribution. Total M&I deliveries are estimated to be 2,000 AFY and account for only a very small percentage of the district's CVP supplies. (Reclamation 2005c)

Santa Clara Valley Water District

Santa Clara County is the largest county in the San Francisco Bay Area, covering 1,312 square miles. The county is populated by almost 1.6 million residents within 15 cities and unincorporated areas. While a significant portion of the County's land area is unincorporated ranch and forest land, 92 percent of the population lives in urbanized areas within the County. Northern Santa Clara County is extensively urbanized, and includes thirteen of the county's fifteen cities and virtually all of the county's residential, commercial and industrial development. The south Valley remains predominantly rural with the exception of the cities of Gilroy and Morgan Hill and the small unincorporated community of San martin. Low-density residential developments are also scattered through the valleys and bordering foothill.

Most of the lands within the unincorporated area of the County consist of ranch and forest land in the Santa Cruz and Diablo Mountain Ranges with scattered low-density residential development. The Diablo Range constitutes about half of the County's total land area. Agricultural uses are found mostly in the southern portions of the County while only small pockets of agricultural land remain in the northern portion of the County. Typical crops grown in Santa Clara County include various vegetables, fruits, nuts, berries, flowers, timber, and Christmas and other ornamental trees. (Reclamation 2004b)

Farmland Categories

Table 3.5-2 contains a description of farmland categories as defined by the U.S. Department of Agriculture, Natural Resources Conservation Service. Some of these farmland categories are found within Fresno, Kings, and Merced Counties. (Reclamation 2005c)

Table 3.5-2. Important Farmland Map Categories

Category	Description
Prime Farmland	Land that has the best combination of physical and chemical characteristics for producing food, seed, forage, fiber, and oilseed crops and is also available for use. It has the soil quality, growing season, and moisture supply needed to produce economically sustained high yields of crops when treated and managed according to acceptable farming methods.
Farmland of Statewide Importance	Land other than Prime Farmland that has a good combination of physical and chemical characteristics for crop production. The land must have been used for production of irrigated crops within the last three years and also meet specific criteria including soil temperature and range.

Table 3.5-2. Important Farmland Map Categories

Category	Description
Unique Farmland	Land that does not meet the criteria for either Prime Farmland or Farmland of Statewide Importance, but that is used for the production of specific high economic value crops. It is land that has a special combination of soil quality, location, growing season, and moisture supply needed to produce sustained high quality or high yields of specific crops.
Farmland of Local Importance	Land that may be important to the local economy because of its productivity.

Source: County of Fresno 2000b.

The California Department of Conservation, Division of Land Resource Protection's Farmland Mapping and Monitoring Program maintains statistical reports on lands by county. These reports contain urban and agricultural land use information as well as information on lands that meet the criteria of Important Farmland. Table 3.5-3 provides land use and farmland information for Fresno, Kings, and Merced Counties.

Table 3.5-3. 2002 Farmland Conversion Data (Acres)

Category	Fresno County	Kings County	Merced County
Prime Farmland	731,149	140,876	286,054
Farmland of Statewide Importance	490,353	431,338	158,405
Unique Farmland	102,946	28,313	100,749
Farmland of Local Importance	74,347	7,565	41,772
Grazing	835,120	236,583	578,892
Urban and Built-up Land	107,532	29,795	33,090
Water	4,911	66	16,970

Source: California Department of Conservation 2002a, 2002b, 2002c

Since 1958, the San Luis Unit has experienced the reclassification of approximately 121,000 acres of lands previously qualified as Prime Farmland. This is predominantly due to increased problems related to drainage and salinity. While these lands are no longer classified as Prime Farmland, the acreage is still classified as Farmlands of Statewide Importance and remains in production. During the past 30 years, approximately 6,000 acres of Prime Farmland in the San Luis Unit have been removed from agricultural production due to increased urbanization and issues involving sediment deposition. This equates to an annual Prime Farmland loss of 200 acres or less than 0.03 percent of the total Prime Farmland in Fresno County alone.

Agricultural Land Use Trends[3]

Some previously farmed land in the study area may remain fallow during a particular growing season. It can be assumed that some of this land also meets the Important Farmland criteria previously listed in Table 3.5-3. The specific districts that have fallowed land and the amounts and locations of the fallowed land vary during each growing season. Among the several reasons that land may be fallowed are:

- Water deliveries, reliability, and timing and their relation to pre-planting and management decisions and costs.
- Water availability.
- Water rights being transferred from one parcel of land to another.
- Economics, including cost controls, commodity pricing, and market conditions.
- Foreclosures.
- Marginal agricultural land or poor soil conditions.
- Growth pressures.

Fallowing is but one response to trends in cropping patterns and land use that have changed in the San Luis Unit over the years. While the unit is dominated by irrigated agriculture, and minor urban areas (Huron, Avenal), commercial uses (Harris Ranch complex, food processors) are also present and increasing. Some formerly irrigated lands are now used for dryland pasture, wildlife habitat, dryland grain, drainwater reuse areas, and sediment settling basins. Westland's crop report indicates that idle and fallow lands have been increasing over the years. Much of the random variation is due to annual water supply variability. The systematic variation associated with the slight upward trend over time is associated with declining land productivity in drainage-impaired areas and long-term water availability restrictions. Other factors, such as increased on-farm irrigation efficiencies and reduced acreage in some high-water-use crops such as alfalfa may have also affected the magnitude of the trend. The trendline and equation are not statistically significant but are included to give the reader a general picture of historic land fallowing conditions.

A summary of cropping pattern changes in Westlands between 1978, 1990, and 2001 are listed in Table 3.5-4. The year 1978 coincides with the first water deliveries to the San Luis Unit's distribution system, and 1990 roughly corresponds to the peak of irrigated acres prior to acreage reductions forced by increased drainage-related salinity problems and decreased water supplies. It should be noted that more recent information on the Westlands internet site indicates about 100,000 acres are now idle in the district. Retired lands increased from 2,091 acres in 2001 to 20,518 acres in 2002.

[3] Entire discussion is from *San Luis Unit Draft Environmental Impact Statement Long-Term Contract Renewal* (Reclamation 2005c).

Table 3.5-4. Crop Summary Data, Westlands Water District

Crop	1978 acres	1990 acres	2001 acres	General trend
Alfalfa hay	13,771	10,716	9,701	Decrease
Cotton	272,061	235,290	188,569	Decrease
Orchards, vineyards	13,012	25,139	59,495	Increase
Small grain	129,130	34,994	50,631	Decrease-stable
Tomatoes	30,224	95,159	85,122	Increase-stable
Other vegetables	37,839	73,706	88,088	Increase
Sugar beets	6,746	7,393	5,007	Variable-stable
Other Field crops	16,584	14,206	7,484	Decrease
Alfalfa seed	17,337	10,716	2,214	Decrease
Fallow, idle	36,335	52,554	73,802	Increase
Double crop	9,021	7,069	12,873	Variable

Reclamation law prohibits delivery of water to lands that Reclamation considers unsuitable for sustained irrigation pursuant to Reclamation's Irrigation Suitability Land Classification System. Some of this land has been irrigated over the years, but none is irrigated today. Development of new irrigation technology and expensive landowner land development and improvement operations have reduced the Class 6 acreage in the San Luis Unit to about 24,000 acres.

3.5.2 County General Plan Policies

Each county and city in the State is required by Section 65300 of the California Government Code to have a comprehensive, long-term general plan for the physical development of the county or city. Mandatory elements of the general plan that have bearing on the Proposed Action are land use and agriculture, fish and wildlife habitat, water resources, economic development, open space and conservation.

This section summarizes key goals and policies contained in the general plans for the six counties in the project area and vicinity, both water development areas and water receiving areas as described in Section 2.1, specifically Fresno, Madera, Merced, Kings, Santa Clara, and Stanislaus counties. Since the Proposed Action and two other Action Alternatives do not involve urban development, the key issue is whether the 25-year Water Transfer Program is consistent with county policies for water resource conservation and agriculture support. Because a portion of the water could be transferred for M&I uses in the San Luis and Santa Clara Valley Water Districts, the issue of growth-inducement is resolved by ensuring that no water would be approved for transfer to M&I uses that would result in land conversion until additional appropriate NEPA, CEQA, and ESA/CESA compliance is achieved (see Sections 2.3 and 2.4).

The goals and policies of each county relevant to the Proposed Action are summarized in Table 3.5-5.

Table 3.5-5. County General Plan Policy Summary

County	Goals and Objectives
Fresno	• Promote the long-term conservation of productive and potentially productive agricultural lands and to accommodate agricultural-support services and agriculturally related activities that support the viability of agriculture and further Fresno County's economic development goals. • Conserve the function and values of wetland communities and related riparian areas throughout Fresno County while allowing compatible uses where appropriate. Protection of these resource functions will positively affect aesthetics, water quality, floodplain management, ecological function, and recreation/tourism. • Protect and enhance the water quality and quantity in Fresno County's streams, creeks, and groundwater basins. • Help protect, restore, and enhance habitats in Fresno County that support fish and wildlife species so that populations are maintained at viable levels. • Preserve and protect the valuable vegetation resources of Fresno County. • Improve air quality and minimize the adverse effects of air pollution in Fresno County. • Designate land for and promote the development and expansion of public and private recreational facilities to serve the needs of residents and visitors. • Identify, protect, and enhance Fresno County's important historical, archeological, paleontological, geological, and cultural sites and their contributing environment. • Increase job creation through regional leadership, agricultural productivity, and development of high-value-added processing firms.
Kings	• Support agriculture by preserving the right of farmers to operate efficiently, based on customary and usual agricultural practices. • Beneficially use, conserve, and protect water resources to assure an adequate long-term supply of water. • Preserve land that contains important natural plant and animal habitats. • Maintain the quality of natural wetland areas identified by the DFG and the Service. • Protect and manage riparian environments as valuable resources. • Manage natural stream environments to provide protection for fish habitat.
Madera	• Encourage continued agricultural use and, where possible, increase agricultural use on lands designated for such use. • Ensure availability of and maintain high quality water sources. • Protect and enhance natural quality of county's streams, creeks, and groundwater. • Protect, restore, and enhance habitats that support fish and wildlife species. • Preserve and enhance open space lands to maintain the natural resources of the county.
Merced	• Rural areas are appropriately designated to meet the agricultural, grazing, wildlife habitat, recreational, natural resource, and other open space needs of the county. • Protect rare and endangered species from urban development and recognize them in rural areas. • Protect surface and groundwater resources from contamination, evaporation, and inefficient use. • Support measures to protect and improve water quality.

Table 3.5-5. County General Plan Policy Summary

County	Goals and Objectives
Santa Clara	• Inventory, map, and monitor the status of agricultural lands. • Enhance the long-term economic viability of agriculture. • Conserve and reclaim water. • Obtain additional sources of imported water. • Restore wetlands, riparian areas, and other habitats that improve Bay water quality. • Protect the biological integrity of critical habitat areas. • Balance recreation and environmental objectives.
Stanislaus	• Provide for the long-term conservation and use of agricultural lands. • Conserve water resources and protect water quality in the county. • Protect fish and wildlife species in the county. • Protect the natural resources that sustain agriculture in the county.

Sources: Fresno County 2000; Kern County Planning Department 1994; Kings County Planning Department 2002; Madera County 1995; Merced County 1990; San Benito County 1994; San Joaquin County 1992; Santa Clara County 1994; Stanislaus County 1994.

3.5.2.1 Indian Trust Assets

Indian Trust Assets (ITAs) are defined as follows (Reclamation 1999):

> Although there is no concise legal definition of Indian Trust Assets (ITAs), the courts have traditionally interpreted them as being tied to real property. ITAs are property interest held in trust by the United States for the benefit of Indian tribes or individuals. Indian reservations, rancherias and public domain allotments are common ITAs. The land associated with these ITAs as well as the resources within the boundaries, such as trees, minerals, oil and gas, are also considered trust assets. Other ITAs include traditional-use areas and fishery resources. Hunting and fishing rights may be ITAs, although under P.L. 280 fishing and hunting are regulated by the California Department of Fish and Game, both on and off reservations (CALFED 1998).

Types of actions which could affect ITAs include an interference with the exercise of a reserved water right, degradation of water quality where there is a water right, impacts to fish and wildlife where there is a hunting or fishing right, or noise near a land asset where it adversely impacts uses of the reserved land (Reclamation 1997).

A complete discussion of ITAs and compliance can be found in the *Final EIS/EIR, Water Transfer Program for the San Joaquin River Exchange Contractors Water Authority 2005-2014* (Reclamation 2004a).

Reclamation examined geographic information system coverage that depicts the distribution of Indian reservations, rancherias, and public domain allotments throughout its Mid-Pacific Region. No Indian lands of any type were found within the San Luis Unit study area (Reclamation 2005c).

3.6 Socioeconomics

The four member districts of the Exchange Contractors include Firebaugh Canal Water District (FCWD), Central California Irrigation District (CCID), San Luis Canal Company, and Columbia Canal Company. The four districts are within Stanislaus, Merced, Madera, and Fresno Counties. These four counties represent the study area for the regional economic impact analysis for the water development area; this analysis is conducted at the four-county level because of the linkages between activities in the Exchange Contractors' service area and the rest of the regional economy.

The water receiving areas consist of the San Luis Unit and Santa Clara Valley Water District. The San Luis Unit runs through Merced, Fresno, and Kings Counties, which includes the geographic service areas of the CVP water contractors within the Unit. Merced and Fresno Counties are discussed as part of the Exchange Contractors service area. Therefore, only Kings County is discussed separately for the San Luis Unit, except for race/ethnicity, where information is discussed for the San Luis Unit service area as a whole. The contractor service areas all run roughly along the Interstate 5/California Aqueduct corridor from the San Luis Reservoir in Merced County in the north, through part of Fresno County, to Avenal in Kings County to the south. Santa Clara Valley Water District boundaries are coterminous with Santa Clara County.

3.6.1 Demographics

3.6.1.1 Population

The four-county water development study area represents a substantial component of the Central Valley's population base. There were over 1.7 million people living within these four counties in 2004 (California Department of Finance 2002, 2005a, see Appendix E). Most of this population is concentrated in the northern (Stanislaus County) and southern (Fresno County) reaches of the study area. Fresno County population is largest at 884,500 people, accounting for about half of the study area total. It is followed by Stanislaus County (504,500), Merced County (240,200), and Madera County (141,000).

Population in the four-county area grew by 21 percent between 1990 and 2000, with Madera County growing the fastest at 40 percent, followed by Stanislaus County (21 percent), Fresno County (20 percent), and Merced County (18 percent). Between 2000 and 2005, population in the study area grew a further 12 percent. Madera County grew 15 percent over the five-year period, followed by Merced County (14 percent), Stanislaus County (13 percent) and Fresno County (11 percent).

Each county contains several incorporated cities in proximity to agricultural activity in the study area. The principal incorporated cities in Fresno County proximate to the study area are Firebaugh and Mendota; in Madera County, Madera; Dos Palos and Los Banos in Merced County; and Modesto and Turlock in Stanislaus County.

Regional population in the four-county area is projected to grow 71 percent between 2000 and 2030, from nearly 1.6 million in 2000 to 2.7 million in 2030 (California Department of Finance 2004a, see Appendix E). The rate of growth is expected to be between 2000 and 2010 (22.6 percent). Merced County is projected to experience the most growth, as its

population is expected to more than double by 2030 relative to 2000. Population growth in the other counties is expected to be more modest, ranging from 62.3 percent in Fresno County to 78.6 percent in Madera County.

According to the U.S. Bureau of the Census (2004), the estimated population in Kings County in 2003 was 138,564. From April 1, 2000, to July 1, 2003, the population in Kings County grew by 7 percent (from 129,461 to 138,564), exceeding the average statewide increase of approximately 5 percent for the same time period. The population figure includes the approximately 15,000 inmates at the Avenal and Corcoran State Prisons (Kings County Planning Department 2004).

Population growth in Santa Clara County is expected to continue, but at slower rates than in the past. Most of the population growth is expected to occur in San Jose to a somewhat lesser extent, in the South County, while the north and west valley cities are expected to experience relatively little population growth (County of Santa Clara, undated; Reclamation 2004b).

3.6.1.2 Race/Ethnicity

The two predominant racial groups in the four-county water development study area are Whites (Caucasian) and Hispanics; together, these groups comprise roughly 87 percent of the region's population (California Department of Finance 2005b, see Appendix E). The sizable proportion of Hispanics living and working in the study area is characteristic of most Central Valley counties, where agriculture supports a large Hispanic workforce. Other racial groups combined represent only 13 percent of the regional population. Asians account for 6.4 percent, Black/African Americans account for 4.0 percent, and other groups account for less than 2.0 percent.

There is little variation in the racial composition among study area counties. Stanislaus County has the highest percentage White population at 58.4 percent and the lowest percentage Hispanic population at 31.7 percent. Fresno County is the most racially diverse county in the study area, with 5.1 percent Black/African American and 8.2 percent Asian residents. The largest percentage Hispanic population in the study area is in Merced County (45.4 percent).

Population and ethnicity breakdowns in the San Luis Unit service area were available by census tract for 1990, the most recent reported census supporting economic modeling. The California Department of Finance develops population and ethnicity estimates and projections at the county level. Implied growth rates from the California Department of Finance's county estimates were applied to the 1990 tract information to generate estimates and projections from 1990 through 2026 for the aggregated tracts. The following census tracts were used to simulate the San Luis Unit service area (Reclamation 2005c):

- Fresno County: Tracts 78, 79, 98, 80, 82, 83, 84, 02
- Merced County: Tract 21, 98
- Kings County: Tracts 3, 16, 17

Table 3.5-6 shows the estimated and projected population and ethnicity in the San Luis Unit service area. As shown in Table 3.5-6, the Hispanic community makes up a large proportion of the regional population. It is estimated that over 63 percent of the regional population was

identified as Hispanic in 2000 and that the percentage is expected to rise to over 76 percent by 2025. These trends are expected to continue through the terms of the long-term renewal contracts (Reclamation 2005c).

Table 3.5-6. Population and Ethnicity-San Luis Unit Study Area[1]

Year	Population				
	White	Black	Other	Hispanic[2]	Total[3]
1990	27,275	4,842	27,908	34,453	60,025
1995	28,754	5,551	35,983	40,754	67,253
2000	29,639	6,498	41,628	46,428	73,174
2005	30,862	7,241	48,940	52,923	80,257
2010	32,003	8,079	56,382	60,010	87,702
2015	33,015	9,054	63,309	67,309	95,193
2020	34,080	9,930	71,950	76,697	104,231
2026	35,078	10,809	80,993	86,896	113,820

Source: U.S. Census Bureau 1990, Reclamation 2005

[1]Estimated and extrapolated from aggregated census tract data.
[2]Hispanic population is also counted as White, Black, or Other.
[3]Equals the sum of White, Black, and Other.

3.6.2 Economic Base

3.6.2.1 Employment and Major Industries

Total employment across the four counties in the water development study area included about 784,700 part-time and full-time jobs in 2003, up 3.3 percent (or nearly 25,000 jobs) annually since 2000 (Bureau of Economic Analysis 2003a, see Appendix E). This annual growth rate is slower than that between 1990 and 2000, when total employment grew by nearly 128,000 jobs (or 20.2 percent). In 2003, total employment was highest in Fresno County and lowest in Madera County. Between 1990 and 2000, Madera County had the largest job growth rate at over 50 percent; however, more recently (2000–2003), job growth was the highest in Merced County at 4.8 percent, with the other three counties experiencing growth rates ranging between 3 and 4 percent.

The economy in the study area is relatively diverse. The largest sector in 2003 was services, which employed over one-quarter million people and accounted for about one-third of the regional job base (Bureau of Economic Analysis 2003b, see Appendix E). Other leading sectors included Federal and State/local government (15 percent of the total job base) and wholesale and retail trade (at least 13 percent). In 2003, farm employment in the study area provided over 58,000 jobs or 7.4 percent of the study area total.

Fresno County provided the greatest number of farm jobs, about 27,850. However, proportionally, Merced and Madera County farm employment is larger, at 12.5 percent and 11.9 percent of the respective totals for the counties. Within parts of the Exchange Contractors service area, the figures are substantially higher because of the agricultural concentration of those subregions. Indirectly, farming and agriculture also provide numerous jobs in industries which supply inputs to agricultural operations, e.g., farm machinery and

fertilizers and industries that are reliant on agricultural commodities, e.g., food processing plants.

Socioeconomics and Power Resources are discussed in Section 3.4 of the San Luis Unit DEIS for Merced, Fresno, and Kings counties. In terms of both earnings and employment, the largest industries in the three counties were services, retail trade, manufacturing, and government (see Tables 3.4-1 and 3.4-2 in Reclamation 2005c). Farm and agricultural services are important to all three counties. Census tracts were used to estimate population data in the San Luis Unit's service area. The Hispanic community makes up a large proportion of the regional population in the San Luis Unit study area (see Table 3.4-3 in Reclamation 2005c).

Total employment in Santa Clara County included about 1,096,400 full-time and part-time jobs in 2003, representing a decrease of 145,125 jobs since 2001 (Bureau of Economic Analysis 2006a). The largest sector in Santa Clara County consisted of private employment, of which, manufacturing employed the largest number of people (181,654 jobs). Other leading sectors included professional and technical services (13.4 percent of the total job base), and retail trade and government and government enterprise (9 percent of the total job base). Farm employment accounted for 5,326 jobs (0.5 percent) in 2003 (Bureau of Economic Analysis 2003a).

3.6.2.2 Unemployment

Unemployment in the water development study area has fluctuated since 1990, falling from 12 percent in 1990 to 9.6 percent in 2000 and subsequently rising to 10 percent in 2004 (California Employment Development Department 2005, see Appendix E). These historical patterns in the study area hold across individual counties and the State; however, regional unemployment has been substantially higher than statewide averages. For example, the unemployment rate in the study area in 2004 was 10 percent, compared to 6.7 percent statewide; such differences were even greater in previous periods. In 2004, Merced County had the highest unemployment rate of the four counties at 10.8 percent, while Madera County had the lowest at 8.8 percent.

3.6.2.3 Income

Total 2003 personal income in the four-county water development study area was $40.2 billion (Bureau of Economic Analysis 2003a, see Appendix E). In real terms, it increased by more than 30 percent between 1990 and 2003. The rate of income growth has been more pronounced in recent years (2000 to 2003) than in the previous decade. Fresno County had the highest personal income in 2003 ($20.7 billion), and Madera County had the lowest ($2.7 billion). Income growth, however, has been greater in Madera County than others, 12.6 percent since 2000. By contrast, Stanislaus income grew 5.5 percent over that period. Among the 58 counties in the State, personal income in Fresno County in 2002 was the 13th largest, Stanislaus was 21st, Merced was 30th, and Madera was 35th (California Department of Finance 2004b).

Earnings by industry are more relevant than total personal income for evaluating the potential impacts of the Alternatives on the local economy because it focuses on wages/salaries of employees and proprietor's (or business) income. Comparable to employment, earnings were

largest in the services sector at $8.4 billion, which accounted for over 30 percent of all earnings in the study area (Bureau of Economic Analysis 2003c, see Appendix E). Other key earnings sectors included Federal and State/local government (20 percent), wholesale and retail trade (at least 11.5 percent), and manufacturing (11.3 percent). Farm-related earnings account for 5.1 percent of the study area total.

In 2002, weighted per-capita personal income in the four-county study area (on a weighted average basis) was $22,841 (see Appendix E). Per-capita income for the State was $32,989 in that year. Based on these figures, per capita personal income in Fresno, Merced, Madera and Stanislaus counties ranked 45th, 51st, 55th, and 32nd in the State, respectively.

Based on 2000 Census data (1999 dollars), the weighted average median household income in the study area was $36,493, about 30 percent lower than the statewide figure of $47,493. Within the study area, median household income was highest in Stanislaus County ($40,101), followed by Madera County ($36,286), Merced County ($35,532), and Fresno County ($34,725) (California Department of Finance 2004b, see Appendix E).

Based on 2000 Census data, the weighted poverty rate in the study area was 15.9 percent, relative to statewide rate of 10.6 percent. The poverty rate in individual counties is highest in Fresno County (17.6 percent), followed by Merced County (16.9 percent), Madera County (15.9 percent), and Stanislaus County (12.3 percent) (California Department of Finance 2004b, see Appendix E).

Total personal income in Santa Clara County was $77,680,349,000 in 2003 (Bureau of Economic Analysis 2006b). When comparing earnings by industry, manufacturing had the largest earnings ($23,068,807,000), followed by professional and technical services ($13,934,174,000) in 2003. Farm earnings accounted for $133,188,000 in Santa Clara County. The per capita personal income was $46,535,000 in Santa Clara County in 2003 (Bureau of Economic Analysis 2006a).

3.6.3 Agricultural Production and Values

Agriculture is one of the primary economic sectors within the Exchange Contractors' service area and has been so for over a century. It provides crops for use in the local area and other national and international markets; supports the local dairy and food processing industries; and contributes importantly to overall local economic activity. Agricultural patterns differ somewhat in the four-county area within which the Exchange Contractors service area is located, the Exchange Contractors service area itself, and the 28,000 acres that are the subject of this analysis.

3.6.3.1 Agriculture in the Four-County Area

There were over 2.5 million acres of land in crop production in the four-county area in 2004 (see Appendix E). Field crops accounted for the most acreage at 52.1 percent of the total. The individual shares of fruit, nut, and vegetable crops ranged from 13 to 18 percent. Seed and nursery crops accounted for less than one percent of the total.

However, field crops accounted for only about 16 percent of annual production value. Fruits, nuts, and vegetables together accounted for over 81 percent of the total and were valued

individually at between $1.5 billion and $1.7 billion (in 2004 dollars). The average production value in the four-county area was $2,395 per acre.

3.6.3.2 Agriculture within the Exchange Contractors Service Area

The primary crops grown within the Exchange Contractors' service area are cotton, melons, alfalfa hay, grains, vegetables, field crops, and orchards and vineyards. All crops are irrigated because of limited rainfall in the entire San Joaquin Valley. The service area is large, no single crop is dominant, and agricultural production is diversified.

Over time, agriculture in the service area has evolved to intensively-farmed crops and away from land-extensive livestock and grain production. Changes have been due to many factors, including crop prices and supplies, changes in consumer tastes, surface water availability, and the development of crop varieties suitable for different soil and climate conditions. Moreover, a comprehensive infrastructure of businesses has developed in support of production agriculture. Each of these sectors purchases from and sells to many other businesses, and changes in agriculture consequently have widespread ripple effects throughout the regional economy; these effects are described in more detail below.

Within the service area, the average total amount of production cropland currently is approximately 231,500 acres (see Appendix E). The largest amount of acreage is in cotton (nearly 30 percent), followed by alfalfa hay and seed, miscellaneous field crops, grains, vegetables, and permanent crops. Currently, the total annual value of crops grown, based on 2004 production values, is estimated at $330.3 million. The acres and per acre values of crops grown in the service area vary substantially. For example, vegetables account for 7.9 percent of acreage, but 23.2 percent of value. Similarly, fruits, nuts, trees and vines account for 4.3 percent of land in production, but 10.9 percent of value.

The cropping patterns within the Exchange Contractors' service area differ importantly from the patterns for the total four-county area. For example, permanent crops account for 4.3 percent of acreage within the Exchange Contractors area and 33.8 percent in the total four-county area. Field crops account for 82.2 percent of Exchange Contractors service area land and 52.1 percent of the four-county area. Cropping patterns for vegetables are more similar with vegetables (including melons) accounting for 10.7 percent of service area land and 13.2 percent of the four-county area (see Appendix E).

3.6.3.3 Agriculture in the Affected 28,000 Acre Area

Approximately 28,000 acres of land in the Exchange Contractors service area are subject to high groundwater tables. Of the affected 28,000 acres, it is estimated that 43 percent (or nearly 12,000 acres) are planted in cotton (see Appendix E). Other significant crops include alfalfa and hay seed, vegetables, and melons, each of which accounts for more than 10 percent of total crop acreage. By value, the leading crop group is vegetables, followed by cotton and melons; these three groups account for 32.9 percent, 28.9 percent, and 23.1 percent of total production value, respectively. Total crop production is estimated at $55.6 million. On a per-acre basis, vegetables are the most valuable commodity with a production value of almost $6,400 per acre.

3.6.3.4 Regional Effects of Existing Agricultural Production

Any change in agricultural production sets in motion a series of "ripple effects" which collectively cause changes in output, employment, and income throughout the regional economy. These linkages are frequently quantified by the use of input-output (I-O) models, which are discussed in Appendix E. In the four-county area, the direct output (or value) of agricultural crop production was over $6 billion in 2004 (see Appendix E). This level of production indirectly supported an additional $3.8 billion in output value, for a total of over $9.8 billion. Direct labor income was nearly $1.4 billion, and over $3 billion in total. The direct and total employment effects of existing agricultural production in the four-county area were approximately 57,700 and 118,000 jobs, respectively.

Crop production in the Exchange Contractors' service area accounted for $330.3 million and $538.2 million in direct and total output, $65.2 million and $153.2 million in direct and total labor income, and 3,198 and 6,507 direct and total jobs, respectively. In the 28,000 acre area, crop production accounted for about $55.6 million and $89.6 million in direct and total output, respectively, which resulted in $11.4 million and $25.8 million in direct and total labor income, and 503 and 1,043 direct and total jobs, respectively.

There were 199,693 acres in production in Santa Clara County in 2005 (Santa Clara County Department of Agriculture 2005). Field crops accounted for most of the acreage at 90.6 percent of the total, but were only valued at $3,940,100. Nursery crops consisted of 0.7 percent of the total, but were a high value at $86,277,500. Vegetable crops accounted for approximately 7 percent of the total, but had a value of $125,607,800 in 2005.

3.7 Environmental Justice

3.7.1 Race and Ethnicity in Water Development Area

The minority population in the Exchange Contractors service area (Fresno, Madera, Merced, and Stanislaus counties) is based on an analysis of race and ethnicity population data for four counties that approximate the area of potential impact from the action alternatives. Population data for the year 2000 are divided into five racial categories: White (and other), Black, American Indian/Eskimo/Aleut, Asian/Pacific Islander, and Hispanic. These categories, as used in the 2000 Census, relied on self-identification of racial/ethnic categories by respondents. Persons of Hispanic origin may be of any race, so this ethnic category is summarized separately.

In comparison to the California state demographics, the four-county area is proportionately higher in Hispanic population (40.7 percent) than is the State (32.4). Racially, the area contains greater percentages of whites and persons of other races (63.6 percent) and Native Americans (2.6 percent) than does the State (63.4 percent and 1.9 percent, respectively).

3.7.2 Low Income in Water Development Area

Low-income populations in the four-county area are identified by several socioeconomic characteristics. As categorized by the 2000 Census, specific characteristics used in this description of the existing environment are per capita income, persons below the poverty level, families below the poverty level, substandard housing, and unemployment rates.

Income and poverty, based on income in 1998 as reported in the 2000 Census, illustrates that the four-county area's per capita and median household incomes are all lower than the averages for the State. Merced County had the lowest per capita income, only $18,536 (1998 dollars). Similar results are found for the percentages of persons living below the poverty level.

Other measures of low income, such as substandard housing and unemployment, also characterize demographic data in relation to environmental justice. Substandard housing units are overcrowded occupied units (1.01 persons or more per room) or lack complete plumbing facilities. Fresno and Merced counties have higher percentages of substandard housing (13.7 percent and 15.6 percent respectively) than does the State.

The four-county area unemployment rate in 2004 was 10.0 percent, significantly higher than the State unemployment rate of 6.2 percent. The highest unemployment rate was in Merced County (10.8 percent).

3.7.3 Water Receiving Areas

Collectively, the water receiving areas comprise all of Santa Clara County and portions of Merced, Fresno, and Kings Counties. Reclamation previously concluded that in examining impacts to the San Luis Unit as a whole, the renewal of the long-term contracts would not adversely affect agricultural production (Reclamation 2005c).

There would be no expansion of existing facilities, no construction of new facilities, and no changes in facility operations to accommodate the transfer water in either the San Luis Unit districts or in Santa Clara Valley Water District.

Consequently, the application of additional water from the proposed transfer is not an issue for minority and low income populations, and identification of these populations within the affected counties is not necessary.

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4.0 ENVIRONMENTAL CONSEQUENCES

This section evaluates the environmental consequences of the Proposed Action and the other two Action Alternatives. Because this document is an Initial Study (CEQA) as well as an Environmental Assessment (NEPA), sections of the CEQA environmental checklist are incorporated into the text. The focus of the impact analysis is on actions by the Exchange Contractors to develop water for transfer to other CVP users in the San Felipe Division and/or the San Luis Unit, but impacts of conveyance and use in the receiving areas is addressed. Use of CVP water in the receiving areas is evaluated for its environmental effects primarily in separate NEPA documents on the long-term renewal of CVP contracts for the San Luis Unit and San Felipe Divisions, but these documents do not address water transfers.

The impact analyses for the water transfer Action Alternatives are based on CVP allocations under current contract provisions where deliveries are often less than 100 percent of contract amounts based on water year type. Recent allocations to the receiving areas within current CVP contracts carried forward represent both the existing condition and No Action benchmarks. The additional water from the proposed transfer program is evaluated herein to determine whether the transfer of water in addition to recent CVP allocations would result in physical or socioeconomic changes to the environment.

In wet years, the transfer water could result in a water recipient's total CVP contract supply exceeding current contracts, i.e., when allocations are 100 percent. If the recipient chooses to take all of their CVP contract supply allocation of 100 percent plus the transfer water to meet current water needs, then the transfer could occur under the following circumstances:

- No new lands would be brought into agricultural production
- Agricultural or other underdeveloped, non-urban land would not be converted to urban uses
- Use of transfer water would be shown by the purchaser to result in a reduction of groundwater or other source of supply.

The environmental consequences under No Action of long-term CVP contract renewal for the San Luis Unit receiving area is summarized below from the DEIS (Reclamation 2005c) for the main resource areas that would be affected. The focus of this summary is on the Preferred Alternative within the San Luis Unit DEIS because it was the final negotiated alternative between the parties of the DEIS. For a description of environmental consequences for all alternatives, see Table S-1 in the Summary and Chapter 2 of the DEIS (Reclamation 2005c).

Drainage and Water Quality. The DEIS Preferred Alternative is not expected to produce drainage conditions or surface water quality impacts that can be distinguished from those that would exist under the No Action Alternative. Because of the tiered pricing provisions of the No Action Alternative, it is expected that deliveries of surface water and pumpage of groundwater would be the same for both alternatives. As a result, both alternatives would

bring the same volume of water and contaminants into the San Luis Unit, resulting in indistinguishable impacts.[1]

Agriculture. The impact to the San Luis Unit total irrigated acreage would be a 1,000-acre decrease during an average year that follows a dry five-year period. In the same period, the value of production would be an $800,000 decrease in total value of production for the San Luis Unit. Impacts to San Luis Unit net farm revenues would range from a $6.3 million decrease during a wet year following a wet five-year period to a $7.3 million increase during a dry year following a dry five-year period.

Socioeconomics/Power Resources. There would be no impacts to power resources because CVP hydroelectric facilities would continue to be operated as under the No Action Alternative conditions. The San Joaquin River region total employment would decrease by 120 jobs and income from profits and wages would decrease by $4.2 million under the average-average hydrologic sequence. The region would lose an estimated 250 persons. Total employment in the region would decrease by 420 jobs and income from profits and wages would decrease by $12.4 million under the dry-average hydrologic sequence. The region would lose an estimated 873 jobs.

Land Use. There would be no direct adverse impacts to land use. Renewed contract water deliveries would continue to accommodate a portion of planned growth and support agricultural land uses as under No Action Alternative conditions.

Air Quality. Similar crops, cropping patterns, and total irrigated acreage would not result in substantial fallowed acreage capable of adverse fugitive dust or related air quality impacts when compared to the No Action Alternative.

Groundwater. Increased pumping in response to reduced surface water deliveries would reduce groundwater levels and salinity under the DEIS Preferred Alternative.

Surface Water Resources. There would be no impacts anticipated to surface water resources under the DEIS Preferred Alternative. Contract total, water to be made available, time for delivery, point of diversion, responsibility for water diversion, water measurement, and rates and methods of payments would not differ substantially from the No Action Alternative.

Soils and Geology. Increased groundwater pumping could increase land subsidence. Increased soil salinity could result from reductions in surface water available for leaching slats through crop root zones or from poor quality groundwater pumped in response to reduced deliveries.

Biological Resources. There would be no adverse impacts to fish, vegetation, and wildlife under the Preferred Alternative. Contract renewal would continue water deliveries accommodating land uses existing under the No Action Alternative. No habitat supporting species would be converted to agricultural or M&I use when compared to the No Action Alternative.

[1] With the completion of the SLDFR ROD in 2007 (see Section 1.3.5) and ongoing discussions of drainage solutions (see Section 1.3.7), No Action may need to be revised to incorporate planned land retirement.

Cultural Resources. There would be no impacts to cultural resources under the DEIS Preferred Alternative. Virtually all of the actions associated with long-term contract renewals are within the range of land uses expected under the No Action Alternative. The area of use, types of use, range of river flows, and range of reservoir fluctuations fall within this range when compared to the No Action Alternative. No changes in land use or additions to contractor service areas would affect cultural resources when compared to the No Action Alternative.

Recreational Resources. No adverse impacts to recreational resources would be anticipated. Facility operations, recreational opportunities, annual use levels, and reservoir water surface elevations would not differ substantially when compared to the No Action Alternative.

Visual Resources. No adverse impacts to visual resources would be expected. Patterns of cultivated and fallowed acreages would remain substantially the same as under the No Action Alternative conditions. Agricultural viewsheds, scenic views, and visibility would not be substantially affected when compared to the No Action Alternative.

Public Health. There would be no adverse impacts to public health or increases in mosquito breeding. No increase in flows or standing water would result when compared with the No Action Alternative.

The current SCVWD CVP contract extends to 2027. The EA for this contract renewal may not be completed for some time. Consequently, the impact analysis for the Santa Clara Water District portion of the water receiving area considers information contained within the *Long-Term Renewal of the Contract Among the United States and the Pajaro Valley Water Management Agency, Westlands Water District Distribution District No. 1, and Santa Clara Valley Water District Providing for Central Valley Project Water Service (Contract No. 14-06-200-3365A), Draft Environmental Assessment* (Reclamation 2004b). This Draft EA analyses the localized impacts of continued water deliveries of 6,260 AFY to the three districts, resulting from the 25-year long-term contract renewal. Similar to the CCID and FCWD water transfer purposes, the water is to be used to offset the annual water supply shortages resulting from environmental concerns and regulations in the Delta. It would not result in increased supplies in SCVWD or WWD beyond contract supplies. (Reclamation 2004b)

The proposed water transfer would be consistent with the Water Transfer Policies for the Exchange Contractors, CCID, and FCWD. All three entities have been involved in the development of this proposed water transfer. This transfer meets the criteria of the Exchange Contractors policy that water eligible for transfer includes: water made available by fallowing ground; groundwater substitution, including groundwater banking projects; and approved conservation projects. No significant long-term adverse impacts on groundwater conditions within the FCWD's service area were determined in the groundwater analysis Section 4.4.2.1, which is also consistent with FCWD's policy. The Proposed Action would not unreasonably impact CCID's operations, including, but not limited to the ability of the CCID to meet its delivery obligations, obtain additional water supplies, and undertake conservation measures, exchanges, transfers, groundwater storage, or conjunctive use programs, which would also be consistent with CCID's policy.

4.1 Air Resources

Significant air quality impacts from the proposed groundwater pumping/water transfer project could occur if:

a) The project conflicts with or obstructs implementation of the applicable Air Quality Attainment Plan or Congestion Management Plan.

b) The project violates any stationary source air quality standard or contributes to an existing or projected air quality violation.

c) The project results in a net increase of any criteria pollutant for which the project region is non-attainment under an applicable Federal or State ambient air quality standard (including the release of emissions that exceed quantitative threshold for ozone precursors).

d) The project creates or contributes to a non-stationary source "hot spot" (primarily carbon monoxide).

e) The project exposes sensitive receptors to substantial pollutant concentrations.

f) The project creates objectionable odors impacting a substantial number of people.

Only item c above, regarding a net increase of any criteria pollutant, would be applicable to the three Action Alternatives; however, emissions would not have any significant impact on ambient air quality in the project area and vicinity. A related issue is whether land fallowing could contribute dust that would affect air quality. (Reclamation 2004b)

4.1.1 No Action

Under the No Action Alternative, agricultural and municipal and industrial (M&I) water users would receive their CVP contractual supplies, subject to the limitations in their contracts with Reclamation, using existing conveyance facilities. They would also rely on groundwater pumping to supplement surface water deliveries or obtain water from other sources. If water supplies are inadequate to meet demands at times, the agricultural water users would fallow lands. Crop idling or land fallowing would occur as necessary under normal land management practices and with land retirement that may occur due to drainage problems.

Under No Action, groundwater pumping (whether for agricultural resources, flooding for wildlife management, or water transfer and/or exchange) could occur within the project area. This would likely involve pumps that may or may not be emissions sources. In any case, due to the number and nature of emissions sources, the San Joaquin Valley will experience continued difficulty in achieving air quality standards. Any activity in the project area that would result in emissions would be expected to comply with the rules and regulations of the SJVAPCD, and therefore would not by itself result in an impact to regional or local air quality. (See Section 4.1.4, Cumulative Effects, for further discussion of regional conditions).

The potential exists for dust from ongoing agricultural operations to contribute to increased suspended PM. Land subject to temporary crop idling (because of water supply shortages or for land management purposes) is normally disked for weed control or planted with a cover

crop, which is subsequently disked. These soil management practices serve to minimize dust, erosion and loss of topsoil, and the development of noxious weeds. Therefore, no adverse change would occur to air quality under No Action Alternative, and existing conditions represent reasonably expected future conditions in the short term. Over the long term, reductions in emissions from implementation of ozone and PM attainment plans may improve air quality conditions.

The San Luis DEIS concludes that long-term contract renewal alternatives are not anticipated to affect air pollutants associated with the relatively minor urban and industrial uses in the San Luis Unit. Therefore, Reclamation focused on potential impacts to air quality conditions that would result from changes in agricultural land uses. The DEIS Preferred Alternative would not result in adverse impacts to air quality when compared to existing conditions. As with the No Action Alternative, land uses under the DEIS Preferred Alternative would include similar crops and cropping patterns as those described in Section 3.5, Land Use. It is assumed that retired or fallowed lands would go to seed with grasses and would be grazed by livestock or occasionally dry farmed. These acreages and cultivation measures are similar to those areas and practices used on lands that have been historically fallowed as a result of crop rotation or periodic cropping pattern changes. Because indirect changes in land use may be limited, it is anticipated that the level of wind erosion potential would not increase under the Preferred Alternative as compared to the No Action Alternative. Therefore, the DEIS Preferred Alternative would not result in adverse impacts to air quality when compared to the No Action Alternative and/or existing conditions. (Reclamation 2005c)

4.1.2 Proposed Action

The impact analysis is presented first, followed by the CEQA checklist. See also Appendix B, Air Quality Technical Report. Although Appendix B was prepared based on an assumption of 20,000 AFY of groundwater pumping, the results are applicable for the reduced level of groundwater pumping of 15,000 AFY now being proposed.

The Proposed Action involves the construction of 15 new wells powered by 15 new engines to pump groundwater in the FCWD and Camp 13 area of CCID. The 15 new pumps would be powered by diesel engines up to 150 brake horsepower (BHP) each. Each well would be located approximately 3,000 to 5,000 feet (0.57 to 0.95 mile apart in a northwest/southeast trending direction. Five pumps are currently installed on five existing wells and would also operate as part of the Proposed Action. Both the installation of the wells and the operation of the pumps would result in air pollutant emissions.

Screening Air Quality Modeling Methodology and Analysis

The air quality impacts of pump engine emissions were modeled with USEPA's general Gaussian-plume atmospheric dispersion model SCREEN3, version 96043. A unit emission rate of 1 gram per second (g/sec) is used to obtain a normalized result in micrograms per cubic meter ($\mu g/m^3$), which is then multiplied by estimated emission rates (in g/sec) for NO_2, CO, SO_2, and PM_{10} to estimate impacts from the Proposed Action. The distance range is 0.25 mile (400 meters) from a typical remote rural well site.

The screening model predicts expected worst case ambient concentrations for Stability Class D. The model predicts maximum 1-hour impacts (in $\mu g/m^3$) and for other regulatory averaging times by multiplying 1-hour average concentrations (in $\mu g/m^3$) by correction factors per USEPA guidance (Screening Procedures for Estimating the Air Quality Impact of Stationary Sources, Revised October 1992):

- Three (3) hours: 0.9
- Eight (8) hours: 0.7
- Daily (24) hours: 0.4
- Annual: 0.08

Because SCREEN3 is conservative, it can be used to demonstrate that Tier 3 BACT pump engine emissions would cause no significant impact on ambient air quality in the vicinity of a well site. Table 3.1-3 in Section 3.1 lists the modeled emission rates for a typical well site under the Proposed Action.

Results of the screening analysis are shown in Table 4.1-1 where estimated ambient concentrations from pump engine operations are compared to NAAQS at the distance range of 400 meters from a typical well site. For the NAAQS analysis, model-estimated maximum concentrations are added to representative background concentrations to assess compliance with NAAQS. Background air quality data were collected from the nearest air monitoring stations (City of Fresno, 2002-04) to yield values for all pollutants (i.e., NO_2, CO, SO_2, and PM_{10}).

The screening results show that, in no case would an individual NAAQS for any pollutant and averaging time be exceeded solely due to emissions from Tier 3 BACT pump engine operation. Proposed Action emissions would not violate any air quality standard or contribute substantially to an existing air quality standard violation (i.e., PM_{10}). There would be no significant air quality impact from operations, because none of the significance criteria defined above would be met.

Table 4.1-1. Tier 3 BACT Emissions Impacts for a Typical Well Site

Criteria Pollutant	Averaging Period	Back-ground Reference	Modeled Maximum ($\mu g/m^3$)	Back-ground Concentration ($\mu g/m^3$)	Total Concentration ($\mu g/m^3$)	State Standard ($\mu g/m^3$)	Federal Standard ($\mu g/m^3$)
NO_X (as NO_2)	1-hour max	Fresno 2003	19.7	169	189	470	–
	Annual	Fresno 2003	1.6	14	16	–	100
SO_x (as SO_2)	1-hour max	Fresno 2003	0.6	26	27	655	–
	3-hour	Fresno 2003	0.6	24	25	–	1300
	24-hour	Fresno 2003	0.3	10	10	105	365
	Annual	Fresno 2003	0.1	2	2	–	80
CO	1-hour max	Fresno 2002	493.1	7376	7869	23,000	40,000
	8-hour	Fresno 2002	345.2	5163	5508	10,000	10,000

Table 4.1-1. Tier 3 BACT Emissions Impacts for a Typical Well Site

Criteria Pollutant	Averaging Period	Back-ground Reference	Modeled Maximum (µg/m^3)	Back-ground Concentration (µg/m^3)	Total Concentration (µg/m^3)	State Standard (µg/m^3)	Federal Standard (µg/m^3)
PM_{10}	24-hour	Fresno 2002	11.8	100	112	50	150
	Annual	Fresno 2002	2.4	40	42	20	50
$PM_{2.5}$	24-hour	Fresno 2002	11.8	100	112	–	65
	Annual	Fresno 2002	2.4	39.6	41.9	12	15

Reference: Screening Procedures for Estimating the Air Quality Impact of Stationary Sources (Revised), USEPA-454/R-92-019, pages 4-16.

Notes: Modeled maximum is for an individual well site at a distance of 0.25 miles (400 meters). Background concentration per SJVAPCD monitoring data (ARB), City of Fresno, 2002-2004

Averaging Period	USEPA Factor
3 hours	0.9
8 hours	0.7
24 hours	0.4
Annual	0.08

4.1.2.1 Impact Analysis

Construction-Related Impacts in Water Development Area

Construction for the installation of the 15 wells would generate emissions from the operation of heavy equipment and support vehicles. In addition, fugitive dust may be generated during activities associated with site preparation. Any disturbed soil would be subject to wind entrainment; thus, implementation of dust control measures would be required at the construction sites to minimize off-site deposition of fugitive dust as required by the SJVAPCD (and as listed in Table 4.1-2).

Table 4.1-2. SJVAPCD Mitigation Measures for Construction Emissions of PM_{10}

All disturbed areas, including storage piles, that are not being actively utilized for construction purposes, shall be effectively stabilized of dust emissions using water, chemical stabilizer/suppressant, covered with a tarp or other suitable cover or vegetative ground cover.
All on-site unpaved roads and off-site unpaved access roads shall be effectively stabilized of dust emissions using water or chemical stabilizer/suppressant.
All land clearing, grubbing, scraping, excavation, land leveling, grading, cut & fill, and demolition activities shall be effectively controlled of fugitive dust emissions utilizing application of water or by presoaking.
With the demolition of buildings up to six stories in height, all exterior surfaces of the building shall be wetted during demolition.
When materials are transported off-site, all material shall be covered, or effectively wetted to limit visible dust emissions, and at least six inches of freeboard space from the top of the container shall be maintained.
All operations shall limit or expeditiously remove the accumulation of mud or dirt from adjacent public streets at the end of each workday. (The use of dry rotary brushes is expressly prohibited except where preceded or accompanied by sufficient wetting to limit the visible dust emissions.) (Use of blower devices is expressly forbidden.)

Table 4.1-2. SJVAPCD Mitigation Measures for Construction Emissions of PM_{10}

Following the addition of materials to, or the removal of materials from, the surface of outdoor storage piles, said piles shall be effectively stabilized of fugitive dust emissions utilizing sufficient water or chemical stabilizer/suppressant.
Within urban areas, trackout shall be immediately removed when it extends 50 or more feet from the site and at the end of each workday.
Any site with 150 or more vehicle trips per day shall prevent carryout and trackout.
Enhanced Control Measures – Required for implementation at construction sites when required to mitigate significant PM_{10} impacts (in addition to Regulation VIII requirements listed above).
Limit traffic speeds on unpaved roads to 15 mph.
Install sandbags or other erosion control measures to prevent silt runoff to public.
Roadways from sites with a slope greater than one percent.
Additional Control Measures – Optional control measures strongly encouraged at construction sites that are large in area, located near sensitive receptors, or which for any other reason warrant additional emissions reductions.
Install wheel washers for all exiting trucks, or wash off all trucks and equipment leaving the site.
Install wind breaks at windward side(s) of construction areas.
Suspend excavation and grading activity when winds exceed 20 mph [regardless of wind speed, an owner/operator must comply with Regulation VIII's 20 percent opacity limitation].
Limit area subject to excavation, grading, and other construction activity at any one time.
Use of alternative fueled or catalyst equipped diesel construction equipment.
Minimize idling time (e.g., 10-minute maximum).
Limit the hours of operation of heavy duty equipment and/or the amount of equipment in use.
Replace fossil-fueled equipment with electrically driven equivalents (provided they are not run via a portable generator set).
Curtail construction during periods of high ambient pollutant concentrations; this may include ceasing of construction activity during the peak-hour of vehicular traffic on adjacent roadways.
Implement activity management (e.g., rescheduling activities to reduce short-term impacts).

Fugitive dust (i.e., uncontrolled wind blown particulates) would be generated during construction activities. Dust emissions can vary substantially depending on levels of activity, specific operations, and prevailing meteorological conditions.

Construction operations are assumed to impact the well location footprint and corridor; however, there are no thresholds of significance for fugitive dust. Because the overall area of soil disturbance for water well construction is relatively small (400 square feet per well, 6,000 square feet total), the impact is considered less than significant. The SJVAPCD requires and strongly suggests the implementation of mitigation measures to minimize any impacts from fugitive dust emissions. These measures could be implemented to further reduce the insignificant impacts.

Table 4.1-3 shows the emission impact thresholds or guidance identified by SJVAPCD for construction projects.

Table 4.1-3. SJVAPCD Construction Emission Thresholds of Significance

Pollutant	Threshold
CO	9 ppm averaged over 8 hours and 20 ppm for 1 hour (20 ppm is equivalent to 150 lbs/hr, 1650 lbs/day or 9900 lbs/wk, and 257 tons/year)
NO_X	10 tons per year
PM_{10}	No quantified threshold; requires mitigation measures (see Table 4.1-2)
ROG	10 tons per year

Source: SJVAPCD CEQA Guide for Assessing and Mitigating Air Quality Impacts, January 10, 2002
http://www.valleyair.org/transportation/CEQA%20Rules/GAMAQI%20Jan%202002%20Rev.pdf

lbs = pounds
ppm = parts per million

Typical well-installation activity would include the following types of equipment:

- Diesel-fired Mud Rotary Drill Rig; likely CME-85 or equivalent,
- Diesel-powered support truck, likely F-350 or equivalent;
- Two (2) gasoline-powered Crew Pickup Trucks, likely an F-150 or equivalent; and possibly
- Gas-fired Generator for a Mud Pump.

Emissions from the well installation activity would not be expected to exceed the relevant significance thresholds, and therefore impacts to existing conditions are less than significant. Emission quantification for construction activities is not necessary because emissions from the vehicles (i.e., flatbed truck, forklift or mobile crane) that would initially deliver the pumping engines and SCR equipment to the well sites would contribute a negligible amount of emissions and are not quantified as part of this report.

Operational-Related Impacts in Water Development Area

Tables 3.1-3 and 3.1-4 in Section 3.1 present estimated emissions for a single engine and for 20 engines, respectively. The groundwater pumping of 15,000 AFY would potentially result in a net increase of criteria pollutants for which the region is non-attainment under Federal or State ambient air quality standards. However, with the implementation of appropriate mitigation, the impacts would be considered less than significant. For this Proposed Action, mitigation is Tier 3 engines with NO_X BACT, as described above; and this engine is to be part of the Proposed Action.

Vehicles that would deliver diesel fuel for the engines and aqueous ammonia for the SCR equipment would contribute a negligible amount of emission and are not quantified as part of this report.

4.1.2.2 Impacts in Water Receiving Areas

For the water receiving areas, there are no adverse impacts to air quality for additional transfer water supplied consistent with current water supplies continued under the long-term contract renewals for the San Luis Unit and the San Felipe Division for the following

reasons. For agricultural water use, acreages and cultivation methods would be similar to those areas and practices used on cultivated lands, and indirect changes in land use would not occur. For M&I water use, water provided consistent with long-term contract provisions and for existing uses only would not stimulate urban growth and indirectly contribute to adverse impacts to air quality. However, deliveries of M&I water in excess of recent allocations under Reclamation's water shortage policy for new development involving land conversion cannot be made until Endangered Species Act (ESA)[2] compliance is completed and any necessary NEPA/CEQA analyses have been conducted separately from this EA/IS. Consequently, there would be no air quality impacts for the Proposed Action.

4.1.2.3 CEQA Checklist

III. AIR QUALITY	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less than Significant Impact	No Impact
Where available, the significance criteria established by the applicable air quality management or air pollution control district may be relied upon to make the following determinations: Would the project:				
a) Conflict with or obstruct implementation of the applicable Air Quality Attainment Plan or Congestion Management Plan?				✓
b) Violate any stationary source air quality standard or contribute to an existing or projected air quality violation?			✓	
c) Result in a net increase of any criteria pollutant for which the project region is non-attainment under an applicable Federal or State ambient air quality standard (including releasing emissions that exceed quantitative threshold for ozone precursors)?			✓	
d) Create or contribute to a non-stationary source "hot spot" (primarily carbon monoxide)?				✓
e) Expose sensitive receptors to substantial pollutant concentrations?				✓
f) Create objectionable odors impacting a substantial number of people?				✓

[2] Land use changes requiring CEQA analysis may also require California Endangered Species Act (CESA) compliance.

Discussion:

a) The Proposed Action would be constructed and operated in compliance with both State and Federal air quality attainment and management plans and with local rules and regulations.

b) Emissions from the construction and operation of the Proposed Action would not violate a State or Federal ambient air quality standard, and would not contribute substantially to any existing or future air quality violation. Construction would not result in significant PM_{10} and fugitive dust emissions. Operation would comply with all applicable SJVAPCD rules and regulations.

c) The Proposed Action would result in a net increase of criteria pollutants for which the region is non-attainment under an applicable Federal or State ambient air quality standard. However, emissions would not have any significant impact on ambient air quality in the vicinity of the Proposed Action.

d) The Proposed Action would not create or contribute to a non-stationary source "hot spot" for carbon monoxide or any other pollutant.

e) The Proposed Action would not expose sensitive receptors to substantial pollutant concentrations. The Proposed Action would not be located in a residential area, and all workers required at the site (both for construction, operation, and maintenance) would be protected by the project's compliance with SJVAPCD rules and regulations.

f) The Proposed Action would not create objectionable odors affecting a substantial number of people, because no odors are associated with the construction, operation, and/or maintenance of the project, and because sensitive receptors are not located in close proximity to the well sites.

4.1.2.4 Mitigation

Construction-Related Impacts in Water Development Area

No significant construction-related impacts are associated with the Proposed Action, and no mitigation is required. However, the SJVAPCD requires and strongly encourages the implementation of mitigation measures (as listed in Table 4.1-2) to minimize any construction impacts from PM_{10} and fugitive dust emissions. Measures to avoid and/or minimize even insignificant impacts to air quality could be included as part of the Proposed Action design and standard construction and operation protocols. The most likely measures are the use of water or chemical stabilizer/suppressant.

Operational-Related Impacts in Water Development Area

The Proposed Action would use diesel engines that meet BACT requirements, so there would be no significant impact. The new engines would be required to meet BACT requirements as outlined in SJVAPCD Rule 4702. As mentioned previously, the BACT standard for NO_X requires a 96.6 percent reduction from Tier 2 and a 94.3 percent reduction from Tier 3, which can only be accomplished by selective catalytic reduction (SCR) for diesel engines. SCR would be implemented on the engines as BACT mitigation.

4.1.3 Alternative Action – Groundwater Pumping Only

This Alternative Action would have the same types of air quality impacts as the Proposed Action because 15,000 acre-feet (AF) of groundwater would be pumped.

4.1.4 Alternative Action without Groundwater Pumping

The Alternative Action without Groundwater Pumping would implement other water development methods in the absence of pumping groundwater, including canal lining and drip irrigation (conservation methods) as well as temporary land fallowing. A maximum of 5,400 acres of farmland would be fallowed under this alternative. The land fallowed would be rotated among the 28,000 acres such that the same land would not be fallowed for the next consecutive four years. Large, contiguous blocks of land would not be idled. The remaining 22,600 acres in the affected 28,000-acre area would continue in agricultural production.

Land subject to temporary crop idling is normally disked for weed control or planted with a cover crop, which is subsequently disked. These soil management practices serve to minimize dust, erosion and loss of topsoil, and the development of noxious weeds. In addition, crop idling in the water development area could be offset by reductions in land fallowing in the agricultural areas receiving the water, especially in critical years.

4.1.4.1 Construction-Related Impacts

No emissions would be associated with the Alternative Action, as no well installation activities or pump deliveries would occur; therefore, no impacts related to air quality would occur.

4.1.4.2 Operational-Related Impacts

No sources of air emissions are associated with the operation of the Alternative Action. In addition, the potential use of temporary land fallowing would result in a decrease in emissions, due to cessation of agricultural equipment and operations for that land (except for soil management practices to minimize dust, erosion, and loss of topsoil). Fallowed land would be disked for weed control or planted with a cover crop, which is subsequently disked. Consequently, the beneficial impact to air quality is not significant.

4.1.5 Cumulative Effects

Water Development Area

A cumulative impact analysis takes into consideration impacts on the environment which result from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time. A cumulative impact consists of an impact which is created as a result of the combination of the project evaluated with other projects causing related impacts. At issue is whether there is a considerable cumulative effect on air quality. A cumulative impacts analysis based on a list of other projects in the area (such as urban development and farming operations) would not be appropriate in an area where attaining air quality standards has proved challenging. Although the Proposed Action's incremental impacts from the installation and operation of

groundwater wells and pumps are individually limited, could they be considered cumulatively considerable? The conclusion is that they are not cumulatively considerable, as explained below.

The topographical and climatologic conditions of the San Joaquin Valley make it difficult for the region to meet State and Federal air quality standards (Section 1.0). Due to strict air quality management regulations, emission levels in the San Joaquin Valley have decreased over the past 15 years, with the exception of PM_{10}, and indicators predict that the downward trend in emission levels will continue. These decreases are predominately due to motor vehicle controls and reductions in evaporative and fugitive emissions (U.S. Department of the Interior 2004). However, the project area is still not in attainment with State and Federal air quality standards including ozone and PM, and is designated as a severe nonattainment area.

For this Proposed Action and the other two Action Alternatives by the Exchange Contractors, it is necessary to view the project's small insignificant impacts in a regional context of past, present, and future projects. With regard to air quality, two sources of emissions would be created with the Proposed Action and the Alternative Action – Groundwater Pumping Only. The first source is combustion and dust emissions from the installation of the 15 new wells. The second source is the operation of the 15 new and five existing diesel-fired engines. Tables 3.1-4 and 3.1-5 show estimated emissions for both fifteen and twenty engines. As discussed in Sections 3.1.1 and 3.1.2, it is not expected that either source of emissions would result in significant impacts.

Based on the existing air quality conditions in the project area, the Proposed Action would have an incremental contribution to a cumulative effect. However, that contribution would not be cumulatively considerable because the project would comply with "specific requirements in a previously approved plan…" (Remy et al. 1999). As required by the CAA, the SJVAPCD must develop attainment plans to demonstrate how they will comply with the standards for which they are nonattainment (PM and ozone). Subsequently, the District must propose and approve air quality regulations to address the pollution problems identified in the required attainment plans. The USEPA approved the 2003 PM_{10} Plan for the San Joaquin Valley. The approval by the USEPA helps to facilitate the emission reductions as proposed in the attainment plan. The current plan for ozone attainment is the *2002–2005 Rate of Progress Plan for San Joaquin Valley Ozone*. A *2004 Extreme Ozone Plan* was submitted to USEPA in November 2004 and is currently under review. Consequently, the incremental contribution of the Proposed Action to air quality problems in the region would not be cumulatively considerable based on the project's compliance with the SJVAPCD rules that are included as part of the ozone and PM attainment plans.

Water Receiving Areas

For the San Luis Unit, cumulative impacts to air quality are not expected to result from the combined effect of the proposed water transfer; interim and anticipated long-term contract renewals; and other past, present, and reasonably foreseeable future actions related to air quality. Growth and development decisions by cities and counties that indirectly affect air quality by increasing the number of vehicles and their emissions will be made independently at the local land use planning decision-making level.

CARB continues to pursue additional incentives to reduce air pollution from agricultural sources, including incentives in Assembly Bill 923 signed by Governor Schwarzenegger. Additional CARB programs include the development of the 2004 San Joaquin Valley Ozone State Implementation Plan, which identifies the clean air strategies needed to bring the valley into attainment with the federal 1-hour ozone standard by 2010, and the implementation of Senate Bill 656 enacted in 2003. This legislation requires CARB, in consultation with air districts, to develop and adopt a list of the most readily available, feasible, and cost-effective control measures that could be employed by CARB and the air districts to reduce inhalable particulate matter (PM10) and the subset of fine particles (PM2.5). The goal is to make progress toward attainment of state and federal PM10 and PM2.5 standards. The proposed control measures are to be based on rules, regulations, and programs existing in California as of January 1, 2004, to reduce emissions from new, modified, or existing stationary, area, and mobile sources. As a second step, the bill requires CARB and air districts to adopt implementation schedules for control measures no later than July 31, 2005. By their nature, these reasonably foreseeable future actions being pursued at different stages of implementation by CARB are designed to address ongoing air quality issues in the San Luis Unit study area. (Reclamation 2005c)

In summary, the Proposed and Alternative Actions with groundwater pumping would have an incremental contribution to a cumulative effect on air quality. However, that contribution would not be cumulatively considerable because the project would comply with specific requirements in SJVAPCD attainment plans. The Alternative Action without Groundwater Pumping would not result in any combustion emissions and, therefore, impacts to air quality in the region would not be cumulatively considerable.

4.2 Biological Resources

The following discussion evaluates potential effects in the vicinity of the Proposed Action. Many potential effects related to water transfers have been addressed in other documents that are incorporated here by reference, including:

- Programmatic Biological Opinion for the Implementation of the CVPIA Preferred Alternative and Proposed Record of Decision (NOAA 2000)
- Biological Opinion on the Effects of the Long-Term Central Valley Project and State Water Project Operations Criteria and Plan (NOAA 2004)
- Consultation on Long Term Renewal of Water Service Contracts in the Delta-Mendota Canal Unit (NOAA January 2005)
- Reinitiation of Formal and Early Section 7 Endangered Species Consultation on the Coordinated Operations of the Central Valley Project and State Water Project and the Operational Criteria and Plan to Address Potential Critical Habitat Issues (USFWS 2005a)
- Conclusion of Consultation on Long Term Renewal of Water Service Contracts in the Delta-Mendota Canal Unit (USFWS 2005b)

- Formal Endangered Species Consultation on the Operations and Maintenance Program Occurring on Bureau of Reclamation Lands within the South-Central California Area Office: Biological Opinion (USFWS 2005c)

Summaries of these documents are presented below.

Programmatic Biological Opinion for the Implementation of the CVPIA Preferred Alternative and Proposed Record of Decision. Reclamation conducted an endangered species consultation on the implementation of the CVPIA and continued operation and maintenance of the Central Valley Project. This consultation and the associated Biological Opinion (NOAA 2000) address potential impacts on Sacramento winter-run chinook salmon, Central Valley spring-run chinook salmon, and Central Valley steelhead.

Biological Opinion on the Long-Term Central Valley Project and State Water Project Operations Criteria and Plan (OCAP). Reclamation and the DWR are currently cooperating in conducting endangered species consultations to address the combined long-term operations of the Central Valley Project (CVP) and State Water Project (SWP). Reclamation is the lead federal agency and Department of Water Resources (DWR) is the lead state agency for these consultations. Reclamation is consulting with the USFWS and the NOAA Fisheries regarding potential operational impacts to species listed pursuant to the federal Endangered Species Act (ESA). DWR is consulting with CDFG regarding potential operational impacts to species listed pursuant to the California ESA. The OCAP is a detailed analysis and explanation of the criteria and procedures for conducting combined CVP and SWP operations (Reclamation 2004d).

As part of the ESA consultation for the OCAP, Reclamation has prepared a biological assessment (BA) analyzing the effects of proposed OCAP actions. The OCAP BA (Reclamation 2004c) addresses the potential environmental consequences of continuing CVP and SWP operations on listed species and analyzes the effects of proposed operations through 2030. The OCAP BA includes descriptions of the actions, the biology of the listed species, and the modeling of present and future conditions resulting from continuing operations. The OCAP BA addresses the continued CVP and SWP operations on fishery resources including winter-run and spring-run chinook salmon, Central Valley steelhead, and delta smelt. It also recommends that these documents account for several considerations, including the appropriate levels of development, and operations associated with legal decisions and related water facilities and projects, including those in the CCID and FCWD.

Consultation on Long Term Renewal of Water Service Contracts in the Delta-Mendota Canal Unit (NOAA 2005). This consultation concludes that all anticipated effects of the LTCR for the DMC Unit to the Sacramento River winter-run chinook salmon, the Central Valley spring-run chinook Salmon, and the Central Valley steelhead are addressed in the October 22, 2004 NOAA Fisheries OCAP Biological Opinion.

Biological Opinion for Formal and Early Section 7 Endangered Species Consultation on the Coordinated Operations of the Central Valley Project and State Water Project and the Operational Criteria and Plan to Address Potential Critical Habitat Issues (USFWS 2005a). This consultation and the associated Biological Opinion (USFWS 2005) address potential impacts on the delta smelt and its critical habitat. This Biological Opinion also concurs that the coordinated operations are not likely to adversely affect the riparian brush

rabbit, riparian wood rat, saltmarsh harvest mouse, California clapper rail, giant garter snake, California red-legged frog, valley elderberry longhorn beetle, soft bird's beak, and Suisun thistle. The Biological Opinion also concludes that no additional effects to the bald eagle are expected beyond those addressed in a 1993 Biological Opinion.

Conclusion of Consultation on Long Term Renewal of Water Service Contracts in the Delta-Mendota Canal Unit (USFWS 2005b). This consultation concludes that the projects reviewed are not likely to adversely affect the San Joaquin kit fox, giant garter snake, riparian brush rabbit, riparian wood rat, California red-legged frog, and palmate-bracted bird's beak.

Formal Endangered Species Consultation on the Operations and Maintenance Program Occurring on Bureau of Reclamation Lands within the South-Central California Area Office (USFWS 2005c). Reclamation conducted an endangered species consultation on the Operations and Maintenance Program occurring on Reclamation lands within the South-Central California Area Office. This consultation and the associated Biological Opinion (USFWS 2005c) address potential impacts on delta smelt, Conservancy fairy shrimp, longhorn fairy shrimp, vernal pool fairy shrimp, vernal pool tadpole shrimp, valley elderberry longhorn beetle, California red-legged frog, California tiger salamander, blunt-nosed leopard lizard, giant garter snake, California condor, bald eagle, California clapper rail, giant kangaroo rat, salt marsh harvest mouse, San Joaquin kit fox, San Joaquin wooly-threads, succulent owl's clover, Hoover's spurge, Greene's tuctoria, San Joaquin Valley Orcutt grass. Additional species addressed include large-flowered fiddle neck, lange's metalmark butterfly, Aleutian Canada goose, California jewelflower, soft bird's-beak, palmate-bracted bird's-beak, Fresno kangaroo rat, Contra Costa wallflower, Bay checkerspot butterfly, Contra Costa goldfields, Alameda whipsnake, riparian woodrat, Antioch Dunes evening-primrose, Bakersfield cactus, hairy Orcutt grass, Hartweg's golden sunburst, Keck's checkerbloom, and riparian brush rabbit.

None of the above documents addresses the green sturgeon, now Federally listed as threatened, which was not proposed for listing as threatened until April 6, 2005[3], or Critical Habitat designated for fish species in January 2005. The Exchange Contractors assume that supplements to these documents or new Biological Opinions will be prepared to address this newly-listed species. Potential effects from actions implemented by non-CCID recipients of water transfers are or will be covered by determinations of no effect or Biological Opinions pertaining to those actions.

Significant biological resource impacts from the proposed groundwater pumping/water transfer project could occur if the project would have an adverse effect on a Federal or State-listed species, or on species proposed for listing. Significant impacts could also occur if:

a) The project has a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special status species in local or regional plans, policies, or regulations, or by the California Department of Fish (CDFG) and Game or U.S. Fish and Wildlife Service (USFWS).

[3] Listing went into effect July 6, 2006.

b) The project has a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, or regulations, or by the CDFG or USFWS.

c) The project has a substantial adverse effect on Federally protected wetlands as defined by Section 404 of the Clean Water Act (including, but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means..

d) The project interferes substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impedes the use of native wildlife nursery sites.

e) The project conflicts with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance.

f) The project conflicts with the provisions of an adopted HCP; Natural Community Conservation Plan; or other approved local, regional, or State HCP.

The Proposed Action water transfer of up to 20,000 AF could utilize 1) 5,000 AF or more of conserved water and/or water from temporary land fallowing and 2) up to 15,000 AF of pumped groundwater for blending in the Outside and Main Canals with surface water supplies from the Mendota Pool for use on CCID agricultural lands. Seventy-three (73) special-status species are potentially present in the vicinity of the three Action Alternatives. However, no special-status species are expected to occur, other than as transitory migrants, in the areas affected by any Action Alternative.

4.2.1 No Action

The potential variation in land use depending on the water available in any given year is described in Section 4.5.1. When water shortages occur, either less land would be cultivated due to crop idling on existing acreages or less irrigation water would be applied. These changes would be temporary, and crop idling or land fallowing would occur as necessary under normal land management practices. Land retirement due to drainage problems could also occur.

Land subject to temporary crop idling is normally disked for weed control or planted with a cover crop, which is subsequently disked. These soil management practices serve to minimize the development of noxious weeds, as well as dust and loss of topsoil. Therefore, there will be no change in effects on biological resources under the No Action Alternative, and existing conditions represent reasonably expected future conditions. The No Action Alternative would have no impacts to biological resources in the project area.

Based on information provided in the San Luis Unit DEIS for the long-term CVP contract renewal, the DEIS Preferred Alternative for that project would not result in adverse impacts on biological resources in the San Luis Unit study area when compared to existing conditions or the No Action Alternative. The renewal of CVP contracts would only continue water deliveries that accommodate current land uses, and that continue to support refuge water and habitat needs and the aims of the habitat restoration and conservation programs that will persist as part of the future under the No Action Alternative. Implementation of the Preferred Alternative would not substantially impact the production of agricultural crops or current

land uses that support habitat. No habitat that supports species would be converted to agricultural or M&I use as a direct result of the renewal of long-term water service contracts. As a result, renewal of long-term water service contracts under the Preferred Alternative would not result in adverse effects on fish, vegetation, or wildlife species located in the San Luis Unit. (Reclamation 2005c)

4.2.2 Proposed Action

4.2.2.1 Water Development Area

In the water development area, no impacts from the construction of the Proposed Action are expected to occur to Federally listed species or other special-status species and no mitigation measures are required. No habitats other than agricultural habitats would be affected; as explained earlier in the document, these particular habitats do not provide usable habitat, even for those few species that may utilize agricultural lands to some degree. However, per SCCAO's policy, standard avoidance measures for San Joaquin kit fox will be implemented for the well construction (USFWS 1999b) if the project is approved. A qualified biologist will inspect each well site prior to the initiation of construction activities.

No impacts to Federally listed species or other special-status species are expected to occur in the water development area from operation of the Proposed Project. There would be no impacts to water quality in wetlands in nearby wildlife refuges (as described in Section 4.4.2.2 and Appendix D). Any water quality changes in the Outside Canal would not affect special-status species, as none occur in the canal. Water quality changes (salinity) in the Main Canal, and therefore potential downstream changes in water quality in refuges and the San Joaquin River, would be so small in magnitude and within the range of normal fluctuations of water delivered from the DMC that there would be no effect on special-status species or essential fish habitat. Fallowed lands would not be fallowed for the next consecutive four years and will be subject to discing for pest control, which will neither create or remove any habitat for special-status species. No proposed or designated critical habitat occurs in the water development areas and so none would be affected.

4.2.2.2 Water Receiving Areas

The transfer of additional water through the Proposed Action to help meet CVP contractors' current water needs is not expected to create or alter habitat within the San Luis Unit because no new lands would be brought into production or converted to other uses. Phase 1 under the Proposed Action is to limit water transfers to existing uses for the full 25-years of the program to avoid indirect effects of potential land conversion on special status species, riparian or wetland habitats, or the movement of terrestrial wildlife or fish.

To the extent that the Proposed Action would make new water available for M&I uses above recent CVP contract allocations based on current water demands in either the San Luis Unit or SCVWD, there is the potential for this water to support the conversion of native lands or agricultural land to urban uses with the potential for impacts to special status species and/or their habitats. To avoid this impact, the Exchange Contractors (FCWD and CCID) would not transfer any water in excess of CVP contract amounts (i.e., 100 percent allocations) unless the following conditions are met:

- No new lands would be brought into agricultural production
- Agricultural or other underdeveloped, non-urban land would not be converted to urban uses
- Use of transfer water would be shown by the purchaser to result in a reduction of groundwater or other source of supply

Use of transfer water for M&I uses would not occur until full compliance with ESA/CESA has been accomplished unless the water purchasers within the SLWD or SCVWD have determined that such conversion would not likely affect listed species or that appropriate mitigation has been provided, in consultation with Reclamation and the Service (see Section 2.4, including the Phase 2 consultation for the Villages project in SLWD).

4.2.2.3 CEQA Checklist

IV. BIOLOGICAL RESOURCES	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less than Significant Impact	No Impact
Would the project:				
a) Have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special status species in local or regional plans, policies, or regulations, or by the CDFG or USFWS?				✓
b) Have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, regulations or by the CDFG or USFWS?				✓
c) Have a substantial adverse effect on Federally protected wetlands as defined by Section 404 of the Clean Water Act (including, but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means?				✓
d) Interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites?				✓
e) Conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance?				✓

IV. BIOLOGICAL RESOURCES	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less than Significant Impact	No Impact
f) Conflict with the provisions of an adopted HCP; Natural Community Conservation Plan; or other approved local, regional, or State HCP?				✓

Discussion:

a) The Proposed Action would not have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special-status species in local or regional plans, policies, or regulations, or by the CDFG or USFWS. No habitat for such species is present in the well field area.

b) The Proposed Action would not have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, regulations or by the CDFG or USFWS. No riparian habitat or other sensitive natural communities are present in the well field area.

c) The Proposed Action would not have a substantial adverse effect on Federally protected wetlands as defined by Section 404 of the Clean Water Act (including, but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means. No Federally protected wetlands are present in the well field area.

d) The Proposed Action would not interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites. No wildlife corridors or native wildlife nursery sites are present in the well field area.

e) The Proposed Action would not conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance. No resources subject to such jurisdiction are present in the well field area.

f) The Proposed Action would not conflict with the provisions of an adopted HCP; Natural Community Conservation Plan; or other approved local, regional, or State HCP. No such plans apply to the well field area.

4.2.3 Alternative Action – Groundwater Pumping Only

This Alternative would entail pumping 15,000 AF of pumped groundwater and blending in the Outside and Main Canals with surface water supplies from the Mendota Pool just as would occur with the Proposed Action. As stated in Appendix D and as summarized in the Proposed Action section above, the groundwater pumping and blending does not affect the quality of water provided to CCID's southern area, or the wildlife management areas adjacent to CCID's southern area or downstream from the Main Canal below the O'Banion Bypass, or the San Joaquin River.

4.2.4 Alternative Action without Groundwater Pumping

Land subject to temporary crop idling is normally disked for weed control or planted with a cover crop, which is subsequently disked. These soil management practices serve to minimize dust, erosion and loss of topsoil, and the development of noxious weeds. Similar to the Proposed Action, no impacts are associated with the Alternative Action. Most of the potential temporary crop idling area is similar to the intensively farmed well field area. Although limited fringes of riparian habitat, consisting primarily of willow thickets, are present along creek banks in some areas of the CCID, and managed marshes are present in the Volta Wildlife Area adjacent to some CCID lands, the proposed fallowing of land for one year followed by a minimum of four cropping years would not result in significant adverse impacts to these habitats.

4.2.5 Cumulative Effects

A cumulative impact analysis takes into consideration impacts that may be created as a result of combining the Proposed Action with other related programs or projects, past, present or reasonably foreseeable future, that have impacts. Because no impacts to biological resources are expected, there would be no incremental effects to contribute to produce cumulatively considerable effects in the larger water receiving areas. In the receiving water areas, current CVP contract allocations plus the new transfer water would not result in additional lands coming under production or land conversion to urban uses.

The blended water would be used entirely within CCID. As described in Section 2.4, transfers of water to non-CVP M&I recipients beyond existing contract allocations and amounts will not be made unless those recipients demonstrate the no land conversion and related circumstances or complete the compliance actions called for in Section 2.4.

4.3 Cultural Resources

The following resource assessment was completed through an archival records search and does not constitute a complete cultural resources evaluation of the well development area. There are four recorded cultural resources within the well development area. One is a prehistoric resource, and three are historic resources. The prehistoric site, P-10-000105 (CA-FRE-105), is a burial site with associated artifacts. The historic resources include the San Joaquin and Kings River Main Canal, P-10-005204, the Delta-Mendota Canal, P-10-005166, and the Delta-Mendota Canal Bridge, P-10-005165. There are no other recorded cultural resources within a one-quarter mile radius of the well development area.

A survey would need to be completed to determine if any cultural resources are present at well site locations. This survey would consist of visually inspecting each of the proposed well locations to determine if any cultural resources are present. Even though the well development area is located in an area of long-time agricultural use, and any cultural resources would have likely already been impacted, resource assessment can only be fully completed with on-site evaluation.

Federal Guidelines/Significance and Integrity

Implentation of an undertaking initiates Section 106 of the NHPA as referenced in Section 3.4.3.1. Cultural resources that could be affected by the undertaking must be evaluated for their eligibility for inclusion in the NRHP.

NRHP evaluation of archaeological sites typically includes subsurface test excavation to determine site boundaries, contents, and integrity. Artifacts and other cultural material are collected from the site, analyzed, and a report on the testing is prepared. This report forms the basis for determining if the site is eligible for the NRHP. The archaeological sites must be found to contain information important to understanding the prehistory of the local area or region and retain integrity in order to be considered eligible.

In addition to meeting one or more of the four specific criteria at 36 CFR 60.4, an archaeological site or historic resource must possess "integrity" to qualify for listing in the NRHP. Retaining integrity is a prerequisite for NRHP qualification and is generally evaluated with reference to location, design (i.e., site structure), and materials (National Park Service 1990). A potentially eligible site must retain the integrity of those values that would make it significant. Typically, integrity is indicated by evidence of preservation of the contextual association of artifacts, ecofacts, and features within the archaeological matrix (i.e., Criterion D) or by retention of those features which maintain contextual association with those historical developments or personages which would make them significant (e.g., Criterion A, B, or C). Evidence of the preservation of this context is typically determined by stratigraphic analysis and analysis of diagnostic artifacts and other temporal data (e.g., obsidian hydration, radiocarbon assay) to ascertain depositional integrity, or by the level of preservation of historic and architectural features that associate a property with significant events, personages, or styles.

Integrity refers to both the authenticity of a property's historic identity, as shown by the survival of physical characteristics that existed during its historic period, and its ability to convey its significance. This is often not an all or nothing situation, and such determinations can be subjective; but the final judgment needs to be based on the relationship between a property's features and its significance.

State Guidelines

According to the State CEQA Guidelines, a project with an effect that may cause a substantial adverse change in the significance of a historical resource or a unique archaeological resource is a project that may have a significant effect on the environment (14 CCR 15064.5[b]).

CEQA further states that a substantial adverse change in the significance of a resource means the physical demolition, destruction, relocation, or alteration of the resource or its immediate surroundings such that the significance of a historical resource would be materially impaired. Actions that would materially impair the significance of a historical resource are any actions that would demolish or adversely alter those physical characteristics of a historical resource that convey its significance and qualify it for inclusion in the CRHR or in a local register or survey that meet the requirements of PRC 5020.1(k) and 5024.1(g).

4.3.1 No Action

No Action means that no well development or additional land fallowing would occur. No Action is similar to existing conditions in the short term, but over time lands could come out of production due to the shallow water table affecting the root zone of crops in the drainage-impacted areas of CCID and FCWD. No Action could only beneficially affect cultural resources if cultural resources were found at well location sites and no alternative sites could be found which is unlikely given the size of the proposed well field.

In the water receiving areas, water use would be consistent with a continuation of current CVP contract amounts and recent allocations under OCAP and the Water Shortage Policy. With no changes to land use, no impacts to cultural resources would occur.

The San Luis Unit's long-term contract renewal Preferred Alternative would not result in adverse impacts to cultural resources when compared to existing conditions or the No Action Alternative. All of the actions associated with long-term renewal of the San Luis Unit water service contracts are within the range of "existing conditions" with respect to land use. While archaeological and historic sites have already been documented within the service areas of four of the nine San Luis Unit contractors (and are likely present in all of the service areas, but simply have not yet been documented), the continuation of existing land uses is not considered adverse, and no specific mitigation measures would be necessary. Specifically, the implementation of the long-term contract renewals would not modify or substantially alter current land uses within the contractors' boundaries. Contract renewal would not alter the area of use, types of use, range of river or stream flows, or reservoir fluctuations (excepting an instance in which the San Luis Reservoir is operated to increase end-of-month storage in September; this occurrence would reduce the present "bathtub ring" effect when compared to the existing condition). (Reclamation 2005c)

4.3.2 Proposed Action

4.3.2.1 Water Development Area

The Proposed Action in the water development area is the installation of 15 water pumping wells and associated pipes to transfer groundwater to existing irrigation canals. The following impact assessment was completed through an archival records search. Full impact to cultural resources can only be assessed after on-site survey of the well locations.

Historical Resources

There are previously recorded historical resources within the well development area including the San Joaquin and Kings River Main Canal, P-10-005204, the Delta-Mendota Canal, P-10-005166, and the Delta-Mendota Canal Bridge, P-10-005165. There would be no impact to the Delta-Mendota Canal Bridge from any of the well sites. There would be impact to the San Joaquin and Kings River and the Delta-Mendota Canals from the installation of wells and associated pipes, but the impact would be less than significant because the wells would not change the use or diminish the integrity of canals or their local historical significance. If any other historical resources were located during the survey of proposed well sites, a potentially significant impact could be avoided through mitigation. The best mitigation would be avoidance and relocation of the well site.

Archaeological Resources

There is one recorded archaeological resource within the well development area; P-10-000105 (CA-FRE-105) is a burial site with associated artifacts. The impact to similar resources that could be present is potentially significant, and mitigation is required to reduce the impact to not significant. If a transfer is approved, when specific well locations are identified, a cultural resource inventory will be conducted to identify cultural resources that may be eligible for inclusion in the NRHP. Following the identification efforts, Reclamation will consult with the SHPO and Indian Tribes on an appropriate finding of effect pursuant to regulations outlining the Section 106 process at 36 CFR Part 800.

4.3.2.2 Water Receiving Areas

In the water receiving areas, important archaeological sites within the San Luis Unit include documented and undocumented prehistoric and historic sites and features, some of which may contain subsurface (buried) accumulations of cultural material (Reclamation 2005c).

Provision of water to either San Luis Unit contractors or SCVWD beyond recent allocations and current contract amounts for M&I purposes for any future needs of the water contractors could possibly result in proposals that would be required to comply with Section 106 of the National Historic Preservation Act and other rules and regulations governing effects or potential effects of new undertakings to cultural resources determined or considered potentially eligible for inclusion on the NRHP.

4.3.2.3 CEQA Checklist

V. CULTURAL RESOURCES	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less than Significant Impact	No Impact
Would the project:				
a) Cause a substantial adverse change in the significance of a historical resource as defined in 15064.5?			✓	
b) Cause a substantial adverse change in the significance of an archaeological resource pursuant to 15064.5?		✓		
c) Directly or indirectly destroy a unique paleontological resource or site or unique geologic feature?				✓
d) Disturb any human remains, including those interred outside of formal cemeteries?		✓		

Discussion:

a) The previously recorded historical resources within the well development area include the San Joaquin and Kings River Main Canal, P-10-005204, the Delta-Mendota Canal, P-10-005166, and the Delta-Mendota Canal Bridge, P-10-005165. There would be no

impact to the Delta-Mendota Canal Bridge from any of the well sites. There could be impact to the San Joaquin and Kings River Main Canal and the Delta-Mendota Canal from the installation of wells and associated pipes, but the impact would be less than significant because the wells would not change the use or diminish the integrity of canals or their local historical significance.

b) The only recorded archaeological resource within the well development area is P-10-000105 (CA-FRE-105), a burial site with associated artifacts. The site should be located, and the area avoided with any proposed well site location. If any other archaeological resources were encountered during excavation of the wells, the best mitigation would be avoidance and relocation of the well site.

c) There are no known paleontological resources, sites, or features within the well development area.

d) The only recorded burial site within the well development area is site P-10-000105 (CA-FRE-105). The site should be located, and the area avoided with any proposed well site location. If any other human remains were encountered during excavation of the wells, the mitigation recommended would be avoidance and relocation of the well site.

4.3.3 Alternative Action – Groundwater Pumping Only

Similar to the Proposed Action, this alternative would not result in adverse impacts as long as the resources are avoided through implementation of measures identified in Section 4.3.6 below.

4.3.4 Alternative Action without Groundwater Pumping

The Alternative Action would implement other water development methods including conservation and land fallowing. Approximately 5,400 acres of farmland could be fallowed under this alternative. The land fallowed would be rotated among the 28,000 acres such that the same land would not be fallowed for the next consecutive four years. The land outside the fallow rotation would remain in agricultural production.

The land subject to this alternative is already in use as agricultural land and is already regularly disked. This alternative would have no additional impact in areas where no cultural resources were located.

4.3.5 Cumulative Effects

All construction activities that disturb the ground surface in the water development area have the potential to impact unidentified cultural resources. Development activity within the region could pose cumulatively considerable impacts. However, assuming these projects would mitigate for disturbance to resources as required (see Section 3.4.3), the cumulative effect of these projects combined with the incremental effect of the new well installation (which would be mitigated) and transfer of additional water is not cumulatively considerable.

Actions associated with the San Luis Unit water service contracts under all of the Action Alternatives are within the range of "existing conditions" with respect to land uses that could

affect cultural resources. Currently, most of the land areas within individual contractor boundaries are being farmed, an activity that has been ongoing for decades. The proposed water transfer would not add to the potential impacts to cultural resources located within San Luis Unit contractor or SCVWD boundaries. Provision of water in excess of contract allocations and overall contract amounts to meet any future needs of the water contractors could possibly result in proposals that would be required to comply with Section 106 of the National Historic Preservation Act and other rules and regulations governing effects or potential effects of new undertakings to cultural resources determined or considered potentially eligible for inclusion on the NRHP. (Reclamation 2005c)

4.3.6 Mitigation

To avoid potentially significant impacts to cultural resources in the water development area, the best mitigation is avoidance. To locate cultural resources to be avoided, a survey of the well sites would be required. A visual survey of each well site would be conducted (and reported to SHPO) to see if any cultural material were present. If any cultural resources were located during the visual survey of the well sites, those well sites would be relocated and the new location surveyed. There is potential for resources to be buried deeply with no visible surface material. The one previously recorded archaeological site within the well development area contained burials located seven feet below the surface. Even if no resources are identified during the survey, those who would do the excavation would be trained to identify cultural material if required by SHPO. If any cultural material was encountered during the digging of any of the wells, work would stop and the site would be evaluated by a qualified archaeologist.

4.4 Hydrologic Resources

The CEQA checklist covers both groundwater and surface water under hydrologic resources. Potential impacts to groundwater resources are addressed first in each alternative section below, followed by surface water resources.

4.4.1 No Action

4.4.1.1 Groundwater Resources

Groundwater conditions and the analysis of impacts of the No Action and Action Alternatives with groundwater pumping is explained in Appendix A, “Groundwater Conditions in the Firebaugh Canal Water District and CCID Camp 13 Drainage District,” by Kenneth D. Schmidt and Associates. The original analysis was completed for a pumping program of 20,000 AFY. Conclusions for a reduced pumping program of 15,000 AFY are similar. Excerpts from this technical report are provided below.

For the No Action Alternative, poor quality groundwater in the upper aquifer beneath the Camp 13 Drainage District and FCWD would continue to migrate to the northeast, into adjoining parts of CCID and Madera County. At some point, other groundwater management activities could be undertaken to partly mitigate this migration, including measures to reduce groundwater overdraft in western Madera County. However, until such activities are

undertaken, there may be even a greater amount of overdraft in the western part of Madera County, due to development of new supply wells for development of previously non-irrigated areas. Groundwater levels are expected to remain shallow in the Camp 13 Drainage Area and FCWD, as long as irrigation based on surface water supplies is continued. In summary, the most important impact of the No Action Alternative would be a continued northeasterly migration of poor quality groundwater in the upper aquifer and the resulting degradation of groundwater quality in adjoining parts of the CCID and in Madera County.

Reclamation has approved the In-Valley/Water Needs Land Retirement Alternative to resolve the San Luis Unit drainage problem. This alternative proposes 194,000 acres of land retirement from irrigated agriculture, and 44,106 acres of this total have already been retired. (Reclamation 2007a)

Under the No Action Alternative, the San Luis Unit Draft EIS concludes that land retirement is expected to have a larger impact on groundwater conditions than urban growth. Land retirement is expected to lead to less deep percolation of applied water and less transport of salts and other contaminants to groundwater. Water not delivered to retired land is likely to be used to increase the reliability of water deliveries to lands that continue under irrigation. Thus, the reduction in deep percolation on retired lands may be partially or entirely offset by increased deep percolation on lands receiving more water than they would have absent land retirement. In addition, by increasing the reliability with which contracted water can be delivered to lands remaining in production, land retirement is likely to reduce the requirement to pump groundwater to meet crop requirements. This substitution of contracted water for groundwater constitutes in-lieu recharge that will help maintain groundwater levels throughout the San Luis Unit during periods when hydrology or regulatory conditions restrict surface water deliveries. (Reclamation 2005c)

4.4.1.2 Surface Water Resources

For the No Action Alternative, surface water would continue to be affected by drainage contributions from the Camp 13 Drainage Area and FCWD under the Grassland Bypass Project which may be extended past 2009. No appreciable change to current surface water conditions would occur, even if some lands are retired in these areas, due to drainage production from the application of irrigation water upslope. See Appendix D, Exhibit 1, Recorded Water Quality, Delta-Mendota Canal at Selected Locations. See also Table 4.4-3 for hydrologic parameters applicable to No Action.

4.4.2 Proposed Action

The Proposed Action consists of developing 20,000 AF of total supply including 15,000 AF groundwater pumping by two of the Exchange Contractors (CCID and FCWD) as a substitute for a like amount of supply to the Exchange Contractors from Reclamation. The water developed from groundwater would be blended into the canal supply of CCID and delivered to entities and areas currently receiving water from CCID. Water developed by the Proposed Action would reduce the total amount of water delivered by Reclamation to the Exchange Contractors and would be available for Reclamation to deliver to CVP agriculture and M&I service contractors using existing conveyance facilities.

4.4.2.1 Groundwater Resources

Water Development Area

There are five potential impacts that may occur in association with the Proposed Action in the water development area. These consist of: 1) drawdowns in the upper aquifer, 2) drawdowns in shallow wells, 3) groundwater flow into Madera County, 4) land subsidence, and 5) groundwater quality. In summary, the most important issue of the Proposed Action for groundwater resources would be a reduction in the northeasterly migration of poor quality groundwater, and a lessening of the deterioration of groundwater quality in adjoining parts of the existing CCID and in Madera County, which would actually result in an overall benefit for the CCID/Madera County areas. Drawdowns would be increased locally during each pumping season, but impacts on pumping lifts in existing supply wells would be minimal. Land surface subsidence is also projected to be minimal.

Drawdowns in Upper Aquifer

In order to determine the drawdown in the upper aquifer (depth interval of about 100 to 350 feet), the Theis Non-Equilibrium Formula was used. Table 4.4-1 provides the typical proposed pumpage. Monthly pumpage would range from about 1,000 to 5,000 AF during March-October. The annual pumpage would be 20,000 AFY. A maximum of 5,000 AF per month would be pumped during June and July. Each well to be used would be capable of pumping 1,900 gpm. There would be a total of 20 wells, located in the area bounded by the DMC and Main Canals, and Fairfax Avenue and the City of Mendota (Figure 7 in Appendix A). Drawdowns were calculated after two months of pumping at the maximum rate of 5,000 AF per month, which is equivalent to about 38,000 gpm. During this period, all 20 wells were assumed to be pumped continuously at 1,900 gpm each. Drawdowns were also calculated for the end of the entire eight-month pumping period. The average pumpage during this period is about 18,600 gpm. For this evaluation, ten of the wells were pumped continuously at 1,900 gpm for eight months.

Table 4.4-1. Proposed Action Groundwater Pumping

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Outside Canal													
Volume - TAF													
Wet	0.0	0.0	0.8	0.8	1.4	2.5	2.9	2.8	2.1	1.8	0.0	0.0	15.0
Above Normal	0.0	0.0	0.7	0.9	1.5	2.4	3.0	2.9	2.2	1.5	0.0	0.0	15.0
Below Normal	0.0	0.0	0.8	1.0	1.6	2.5	3.0	3.0	1.8	1.4	0.0	0.0	15.0
Dry	0.0	0.0	0.7	0.9	1.7	2.9	3.5	2.6	1.4	1.4	0.0	0.0	15.0
Critical	0.0	0.0	1.1	0.8	1.5	2.6	2.9	3.3	0.8	2.0	0.0	0.0	15.0
Flow - CFS													
Wet	0	0	12	14	22	42	48	45	35	29	0	0	
Above Normal	0	0	11	15	24	40	49	46	37	24	0	0	
Below Normal	0	0	12	16	26	42	49	49	30	23	0	0	
Dry	0	0	11	15	28	48	56	43	24	22	0	0	
Critical	0	0	17	14	24	44	48	54	14	32	0	0	
EC - uS/cm	3,200	3,200	3,200	3,200	3,200	3,200	3,200	3,200	3,200	3,200	3,200	3,200	

Source: Appendix D, Surface Water Resources Technical Report, Table 6

An aquifer transmissivity of 215,000 gpd per foot and storage coefficient of 0.01 were used to determine drawdowns. The 20 wells were grouped into four groups of wells (represented by a centroid) to simplify the calculations.

Following the 49-day pumping period for the Snyder Well and the 54-day pumping period for the Del Rey Well in 2002, water levels in the pumped wells recovered within about one day and one and a half days, respectively, to the static levels prior to pumping. Following the 14-day pump test on FCWD Well 11 in 1988-89, the water level in the pumped well completely recovered in one week. This information indicates that full recovery would occur following each season's pumping.

Calculations indicate that maximum drawdowns in the well field after two months of pumping at the maximum rate would range from about 115 to 125 feet. Experience in the area and water-level records indicate that such drawdowns will not compromise the pumping rates proposed. At the end of the whole pumping period of eight months, drawdowns would be less because of the lower average pumping rate, compared to maximum pumping rates during a shorter period. Drawdowns in the well field would range from about 65 to 90 feet. These calculations are based on the assumption that there is no recharge. Because there is recharge to the upper aquifer, actual drawdowns would be somewhat less than indicated by these calculations.

Calculations indicate that after two months of pumping at the maximum rate, the drawdown would be about 25 feet at a point one mile northeast or downgradient from the northeast edge of the well field, and about 15 feet at a point two miles northeast. After two months of pumping at the maximum rate, the drawdown at a point one mile west of the west boundary of the well field would be about 30 feet. At a point two miles west, the drawdown would be about 20 feet. Figure 8 in Appendix A shows maximum projected drawdowns in the upper aquifer after two months of pumping.

As part of this evaluation, groundwater inflow into the upper aquifer into the reach where the well field would be constructed was calculated, as well as groundwater outflow to the northeast. The groundwater flows through longer segments in this area were determined by KDSA (1997b). Darcy's Law was used to estimate groundwater flows, by using values for transmissivities, hydraulic gradients, and widths of flow. The hydraulic gradients used in this evaluation were determined from Figures 3 and 4 in Appendix A. The transmissivity used was 215,000 gpd per foot. An average of about 5,300 AFY of groundwater inflow was determined for the reach between Fairfax Avenue and Mendota. There was an average of 17,000 AFY of groundwater outflow to the northeast (near the San Joaquin River).

These values are considered accurate within about 15 percent. This increased downgradient flow compared to the upgradient flow is attributed to recharge in the intervening area (FCWD, Camp 13 Drainage Area, and San Joaquin River) due to canal seepage, river seepage, and deep percolation of excess applied irrigation water in the area. Pumpage of 20,000 AFY would thus be enough to control most of the northeasterly flow of poor quality groundwater in this area. This would enhance the quality of the downgradient groundwater in the upper aquifer.

Drawdowns in Shallow Wells

Drawdowns in shallow wells (above a depth of about 20 feet) were determined during each of the three long-term pump tests that were previously discussed. For the FCWD Well 11 test near Arbios, drawdowns of about half a foot were obtained after two weeks of continuous pumping of the well. However, results of the test indicated that these declines (which occurred during a period of no canal flow or irrigation) could be offset due to canal seepage and irrigation in the vicinity. Also, when pumping stopped, the shallow water levels recovered relatively quickly.

For the pump tests on the Snyder and Del Rey Wells, both shallow groundwater levels and drain flows were monitored during the pumping periods. HydroFocus, Inc. (2003) reported on the results of these tests. The water-level trends were influenced by background seasonal water-level declines and irrigation of crops on nearby fields. Drawdowns in shallow observation wells near the Snyder Well ranged from about 0.1 foot at a distance of about 2,000 feet from the pumped well to about 0.6 foot at a distance of several hundred feet. Drawdowns near the Del Rey Well ranged from 0.1 foot or less at a distance of about 2,000 feet from the pumped well to 0.3 foot within a few hundred feet. Small reductions in drain flows were reported, but the evaluation was complicated by background seasonal trends in drain flows, and that the apparent changes in flow were relatively small.

HydroFocus (2003) developed a groundwater model to estimate changes in drain flows due to pumping from the upper aquifer. These model results suggested a reduction in drain flows of about 4.5 AF per 1,000 AF of pumping (approximately the amount pumped from the Snyder and Del Rey Wells during the pilot tests). Belitz and Phillips (1992) predicted a reduction in drain flows of about 8.7 AFY per 1,000 AF of pumpage from the upper aquifer on an annual basis. The existing drain flow is about 5,000 AFY in the FCWD and 2,000 AFY in the Camp 13 Drainage District. For a pumpage of 20,000 AFY as proposed, the reduction in drain flows would thus appear to be in the range of about 90 to 180 AFY.

The average spacing between the wells proposed to be pumped would be about 4,500 feet. Based on the results of the pump tests, the projected shallow water-level declines at the end of each pumping season would likely range from about half a foot within several hundred feet of the wells to about 0.2 feet midway between the wells.

Groundwater Flow into Madera County

The previous discussion indicates that about 100 to 200 AFY of the proposed pumpage would be from reduced drain flows. Another approximately 700 AFY of pumped water would be from reduced downward flow through the Corcoran Clay, due to decreased downward head gradients. Another several hundred AFY would be from reduced evaporation of shallow groundwater due to lowered shallow groundwater levels. The remainder of the pumpage (about 19,000 AFY) would be from decreased outflow of groundwater into other parts of the CCID and Madera County, compared to the present flow. Degradation in groundwater quality in the southwest part of Madera County was discussed in the Madera County Groundwater Management Plan by Todd Engineers (2003). This degradation in the area east of the San Joaquin River was attributed to the easterly migration of poor quality groundwater from the area west of the river.

Under predevelopment conditions (i.e., the late 1880s), the trough of the valley (San Joaquin River) was the topographic and hydraulic low spot in the area. Under these conditions, the groundwater in the upper aquifer on both the west and east sides of the river discharged into the river, was consumed by evapotranspiration of native plants, or was evaporated (Belitz and Heimes, 1990). However, with the development of irrigation primarily using surface water supplies in the area west of the river, and the development of previously unirrigated areas in southwestern Madera County to irrigated lands based primarily on groundwater pumping, a northeasterly direction of groundwater flow was developed several decades ago. This has allowed the easterly migration of poor quality groundwater from west of the San Joaquin River to the northeast, in some cases into Madera County. Such an occurrence has been well documented in the Mendota area, for both City wells west of the Mendota Pool, and a number of CCID wells in the area northwest of Mendota (Luhdorff & Scalmanini and KDSA 2004). The TDS concentrations of groundwater in much of the area east of the San Joaquin River averages less than 500 mg/l.

In order to fully address the degradation of groundwater quality in southwestern Madera County, two combined actions would ultimately be beneficial. The first would be interception of this poor quality groundwater west of the river, which would be done as part of the Proposed Action. The second would be actions in Madera County to stop the water-level declines or groundwater overdraft, which is largely in undistricted areas north and east of the Columbia Canal Company service area. In order to do this, pumping in that area would have to be reduced or recharge increased. Alternative water supplies would need to be developed to support the existing development. Madera County has two grants from the Department of Water Resources (DWR) to develop groundwater management plans to address the overdraft problem.

Land Subsidence

Most of the historic land subsidence on the west side of the San Joaquin Valley due to groundwater pumping was primarily associated with pumping from the lower aquifer (below the Corcoran Clay). A comprehensive subsidence monitoring program was undertaken by the U.S. Geological Survey and Reclamation in the 1950s. Included were a number of compaction recorders, and a number of transects (normally roads) along which the land surface elevations were measured. Two of the compaction recorders in the Mendota-Firebaugh area are still operational. One is near the DMC and Russell Avenue, and the other (Yearout Ranch) is east of Mendota near San Mateo Road. As part of the Mendota Pool Group pumping program, another compaction recorder (Fordel) was installed near the Mendota Airport.

Groundwater pumpage near Mendota is primarily from the upper aquifer. Results of monitoring at the Yearout Ranch and Fordel compaction recorders have been discussed in detail in annual monitoring reports by Luhdorff & Scalmanini and KDSA. For pumpage above the Corcoran Clay, most of the monitored subsidence near Mendota has been relatively small (less than 0.05 foot) and has been reversible. That is, the land surface largely rebounds once seasonal pumping stops each year. For the Proposed Action, pumping water levels would be about the same as historically measured in and near the MPG well fields. Projections indicate that the total irreversible subsidence due to pumping for the Proposed

Action would be less than 0.2 foot over the proposed 25-year pumping program. This is relatively small compared to subsidence in the area from deep well pumpage in adjoining areas. Because the pumped wells would be located primarily along or parallel to the Outside Canal, this subsidence would not have a significant impact on canals or other structures in the area. The reduction in downward flow of groundwater to the lower aquifer (700 AFY) would be small compared to pumpage from the lower aquifer in adjoining areas.

Groundwater Quality

Because much of the northeasterly migrating poor quality groundwater would be intercepted and exported from the area where the water for transfer would be developed, the Proposed Action would enhance the quality of groundwater down-gradient and to the northeast of the Camp 13 Drainage Area. This includes groundwater both west of the San Joaquin River and to the east in Madera County. As discussed previously, this northeasterly migration of poor quality groundwater was indicated by Todd Engineers (2003) to be one of the most important groundwater problems in Madera County. Groundwater quality (high salinity) is discussed in the Appendix A technical report for this EA/IS.

Proposed Monitoring

There is an existing monitoring program, which is described in Section 3.1.4.6. The objectives of the proposed monitoring would be to evaluate the proposed pumping program on:

1. The quality of downstream canal water.
2. Shallow groundwater levels.
3. Water levels in existing supply wells.
4. Flows in drain sumps.
5. Land surface subsidence.

This monitoring would ensure this level of pumping is sustainable over the 25-year period.

Canals

Two additional sampling points would be developed for the Main Canal and two more for the Outside Canal. One set would be upstream of the most upstream proposed well discharge into each of the canals. The other set would be downstream of the most downstream proposed well discharge into each of the canals. The same sampling frequency and constituents determined would be used as for the existing program.

Shallow Observation Wells

Measurements for the existing monitoring would continue, except one round of water-level measurements would be made just before pumping starts, and another during the last week of pumping.

Rain Sumps

Existing monitoring would continue with no changes.

CCID Wells

Existing monitoring would continue with no changes.

Subsidence

Existing monitoring would continue with no changes.

Project Supply Wells

Flowmeters would be installed on each of these wells and read weekly during the duration of pumping. Static water levels in each well would be measured in the spring and fall, and also just prior to the commencement of pumping from these wells each year. Pumping levels would be measured in these wells on a monthly basis during pumping periods. Water samples would be collected near the end of the peak pumping period from each well for irrigation suitability and selenium analyses. Monthly samples would be analyzed for electrical conductivity. Annual technical reports would be prepared on the results of monitoring, including any necessary revisions in the monitoring program or in the pumping schedule.

Water Receiving Areas

In the San Luis Unit, the DEIS Preferred Alternative for the long-term contract renewal is not expected to produce changes in groundwater conditions that can be distinguished from those that would occur under the No Action Alternative. This is because the tiered pricing provisions of the Preferred Alternative are identical to those of the No Action Alternative. Distinctions between the Preferred Alternative and the No Action Alternative, such as the difference in measurement requirements, are not expected to have an adverse effect on groundwater conditions (Reclamation 2005c). Consequently, the water transfer from CCID and FCWD with the application of the additional water to existing lands would not have adverse effects on groundwater resources within the San Luis Unit.

In Santa Clara Valley Water District, the additional transfer water could result in less groundwater pumping locally, especially during dry periods, but on a small scale. Consequently, adverse effects on local groundwater resources from the transfer water are unlikely. CVP surface water supplies help the SCVWD to conjunctively manage surface and groundwater resources.

4.4.2.2 Surface Water Resources

This analysis is derived from Appendix D which provides detailed assumptions on water diversions and deliveries using a canal operations or routing model.

Water Development Area

The areas that would develop the water for transfer are solely within CCID, including the Camp 13 Drainage Area, and FCWD. The Proposed Action would involve the development of new and use of existing wells adjacent to the CCID Outside Canal. Pumping from the

wells would blend into the CCID's canal supply and be delivered downstream. Entities receiving deliveries from or through CCID would experience no change in water supply, but would potentially experience a change in the water quality of their supply. Consequently, the environmental issues addressed herein are focused on water quality impacts of the maximum groundwater component on water deliveries, and subsequently the San Joaquin River. Additional water development from conservation and temporary land fallowing measures would not introduce water of lesser quality into the delivery system (see Section 4.4.4.2).

An analysis was developed to evaluate the potential change in water quality associated with deliveries that may be affected by the Proposed Action. A spreadsheet mathematical model was utilized to perform a mass-balance routing of water and water quality for the areas potentially affected. The analysis is described in Appendix D, Surface Water Resources Technical Report, and is summarized below.

The Proposed Action consists of pumping 15,000 AF of groundwater into the Outside Canal, blending that groundwater in the canal and delivering the blended water to downstream locations. For a year of operations, the depiction of current hydrologic conditions is selected. Such No Action hydrologic parameters as the flow and water quality at the headworks of the canals and within the Mendota Pool are established. Deliveries from and supplies into the canals are also established. The Proposed Action in terms of pumping quantity and quality, and canal disposition is then identified and is incorporated into the operation by the model. Results are provided in terms of canal flows and quality at various locations. Figure 4.4-1 illustrates a schematic of the model.

The model separates the Outside and Main Canals' operation into three general geographical reaches (sections). Section 1 represents the area from the headworks at Mendota Pool to a location near the town of Firebaugh. Within this area canal flow would be depleted due to local deliveries and supplemented by existing groundwater pumping, tailwater recapture and drainage pumping (supplies). The flow and water quality at the end of Section 1 is computed as the blend of headworks diversions and canal supplemental supplies, depleted by canal deliveries. The protocol for calculating conditions at the end of Section 1 assumes that canal deliveries are depleted at the most downstream point in the section, removing water from the canal at a water quality equal to the blend of headworks diversions and supplemental supplies.

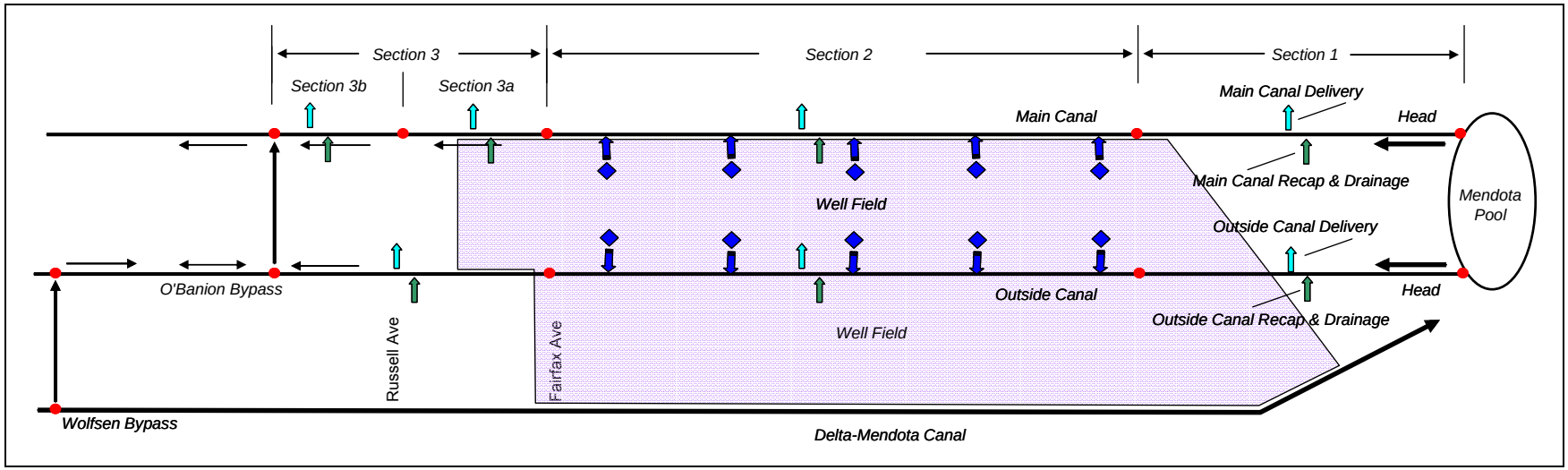


Figure 4.4-1. Schematic of Canal Operations Model

Section 2 generally represents the reach of each canal where the proposed pumping would occur. This area begins at the end of Section 1 and continues to a location at the northern end of the proposed well field, near Fairfax Avenue. The model incorporates existing supplemental supplies to the canals along with canal reach deliveries. Proposed Action groundwater pumping is selected for the operation which requires the identification of the annual quantity of pumping, its monthly distribution and quality, and the relative amount of pumping delivered to the Main Canal and Outside Canal. The flow and water quality at the end of Section 1 is computed as the blend of flow from Section 1 and canal supplemental supplies, depleted by canal deliveries. The protocol for calculating conditions at the end of Section 2 assumes that canal deliveries are depleted at the most downstream point in the section, removing water from the canal at a water quality equal to the blend of flow from Section 1, supplemental supplies and Proposed Action pumping.

Section 3 represents the canals' condition downstream of the well field. This section is modeled to represent the quality of water delivered from the canals as it may be affected by the Proposed Action and blended with supplies from the DMC. Section 3 for the Outside Canal represents an area beginning at the end of Section 2 and continues downstream to the O'Banion Bypass. At that point Outside Canal flow mixes with Outside Canal flow originating from the DMC from the turnout at Milepost 76.05. For the Main Canal, Section 3 has been disaggregated into Section 3a and Section 3b. Section 3a represents the area beginning at the end of Section 2 and continues to a location near Russell Avenue (a location near the northern-most turnout of CCID's southern service area). Section 3b begins at this point and continues to the connection with the O'Banion Bypass. Section 3b generally represents an area where turnouts to the Grassland Water District occur (representing a demand pattern indicative of wildlife management areas).

Modeling Assumptions

Several hydrologic parameters are assumed for this analysis. The operation of Proposed Action pumping and CCID's canals can vary from year-to-year depending upon available supplies, weather conditions, maintenance needs, and conveyance commitments. A "most typical" scenario has been developed to illustrate the potential water quality effects of the Proposed Action.

The Proposed Action develops up to 15,000 AF of groundwater pumping as a substitute supply for Reclamation's deliveries to CCID.[4] The Proposed Action anticipates the patterning of groundwater pumping to direct impacts to certain areas and minimize the water quality effect to all other areas. In this scenario, the majority of water quality effect of the Proposed Action is directed to the Section 2 area of the Outside Canal, the area associated with the drainage to be reduced. This effect would be accomplished by pumping the Proposed Action groundwater component volume (15,000 AF) into Section 2 of the Outside Canal. The groundwater pumping would occur in a pattern that is conducive to blending with deliveries from the DMC and Mendota Pool. The model was iteratively executed to test

[4] The Proposed Action would develop up to 20,000 AF of water for transfer, up to 15,000 AF from groundwater pumping into CCID's canals. The remaining 5,000 AF of transfer water would be developed through conservation and rotational land fallowing. A large portion of the 5,000 AF would be developed within FCWD which would not affect the diversions assumed in the analysis of CCID's canal operation. The small portion of the 5,000 AF developed in CCID's service area has not been included in the modeling, and if modeled would have a very small and inconsequential affect upon the results presented.

alternative distributions of Proposed Action pumping, ultimately deriving a pattern that produces a generally constant quality of water in Section 2 within a year during the period of Proposed Action pumping. The derived patterns vary by year type, as the primary source water of the canals (Mendota Pool) varies. No pumping into the Main Canal is assumed for the typical operation. Table 4.4-2 depicts the monthly pattern assumed for up to 15,000 AF of Proposed Action groundwater pumping. The assumed water quality of the pumping (3,200 uS/cm) equates to approximately 2,000 parts per million (ppm) Total Dissolved Solids (TDS).

Table 4.4-2. Proposed Action Groundwater Pumping

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Outside Canal													
Volume - TAF													
Wet	0.0	0.0	0.8	0.8	1.4	2.5	2.9	2.8	2.1	1.8	0.0	0.0	15.0
Above Normal	0.0	0.0	0.7	0.9	1.5	2.4	3.0	2.9	2.2	1.5	0.0	0.0	15.0
Below Normal	0.0	0.0	0.8	1.0	1.6	2.5	3.0	3.0	1.8	1.4	0.0	0.0	15.0
Dry	0.0	0.0	0.7	0.9	1.7	2.9	3.5	2.6	1.4	1.4	0.0	0.0	15.0
Critical	0.0	0.0	1.1	0.8	1.5	2.6	2.9	3.3	0.8	2.0	0.0	0.0	15.0
Flow - CFS													
Wet	0	0	12	14	22	42	48	45	35	29	0	0	
Above Normal	0	0	11	15	24	40	49	46	37	24	0	0	
Below Normal	0	0	12	16	26	42	49	49	30	23	0	0	
Dry	0	0	11	15	28	48	56	43	24	22	0	0	
Critical	0	0	17	14	24	44	48	54	14	32	0	0	
EC - uS/cm	3,200	3,200	3,200	3,200	3,200	3,200	3,200	3,200	3,200	3,200	3,200	3,200	

The pumped groundwater does not contain selenium (Se), and its application to CCID lands does not produce poor quality discharges.

Existing groundwater pumping, tailwater recapture, drainage pumping and deliveries are defined for each canal section. Table 4.4-3 depicts these hydrologic parameters for non-critical years, which are assumed to be the same for both the existing and the Proposed Action conditions. During critical years the canal water deliveries are assumed to be reduced to approximately 77 percent of the non-critical year volumes. This proportion represents the ratio of critical year Exchange Contract annual entitlements (650,000 AF) to non-critical year entitlements (840,000 AF).

Table 4.4-3. Canal Supplemental Supplies and Deliveries – Non-critical Years

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Main Canal												
Section 1												
Supply - CFS	0	7	7	8	15	21	25	21	8	3	1	0
Supply - EC	NA	935	936	922	915	905	887	914	934	932	926	NA
Delivery	0	13	14	15	29	41	50	42	15	5	3	0
Section 2												
Supply - CFS	0	5	6	6	12	17	20	17	6	2	1	0
Supply - EC	NA	676	682	608	574	527	437	569	671	659	629	NA
Delivery	0	143	158	167	322	455	550	459	170	56	32	0
Section 3a												
Supply - CFS	0	1	1	2	3	4	5	4	2	1	0	0
Supply - EC	NA	676	682	608	574	527	437	569	671	659	629	NA
Delivery	0	13	14	15	29	41	50	42	15	5	3	0
Section 3b												
Supply - CFS	0	0	0	0	0	0	0	0	0	0	0	0
Supply - EC	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Delivery	74	56	35	36	105	66	28	114	350	264	104	68
Outside Canal												
Section 1												
Supply - CFS	0	5	6	6	12	17	20	17	6	2	1	0
Supply - EC	NA	757	761	706	681	645	578	677	753	744	722	NA
Delivery	0	13	14	15	29	41	50	42	15	5	3	0
Section 2												
Supply - CFS	0	4	4	5	9	12	15	13	5	2	1	0
Supply - EC	NA	676	682	608	574	527	437	569	671	659	629	NA
Delivery	0	31	34	37	70	99	120	100	37	12	7	0
Section 3												
Supply - CFS	0	0	0	0	0	0	0	0	0	0	0	0
Supply - EC	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Delivery	0	13	14	15	29	41	50	42	15	5	3	0

Note: Supply represents the combination of existing groundwater pumping, tailwater relift and drainage pumping. EC is displayed in uS/cm.

Results

The Proposed Action is depicted by modeling five water year type snapshots of a typical anticipated operation of CCID's canals and the proposed groundwater pumping. The Proposed Action would occur every year, providing up to an additional 15,000 AF of groundwater pumping into the supply system of CCID. The pattern in which Proposed Action pumping would operate in a year could likely be somewhat different than depicted by the modeling, and would be dependent upon then-existing hydrologic conditions. The varying conditions that could influence the operation of the project would include the quality of water delivered by Reclamation at Mendota Pool, water demands and the desired quality of the water provided to CCID's customers.

Results of this analysis primarily focus on the change in the quality of water delivered by CCID at various locations along its Outside Canal and Main Canal. The amount of water delivered by CCID would remain the same as delivered without the Proposed Action. Diversions to the Outside Canal from Mendota Pool would be reduced by the amount of project pumping into the canal. Impacts within the CCID service area are described in detail in Appendix D. This section presents the impacts to the service areas and to the San Joaquin River.

- **Lower DMC and Mendota Pool.** No change in water quality in the Lower DMC or Mendota Pool would occur since the groundwater pumping of the Proposed Action enters only CCID's Outside and Main Canals. The lower DMC and Mendota Pool continue to provide source water for CCID's canals.
- **Uppermost Reach of Outside Canal, and Main Canal to Approximately Russell Avenue.** In the areas served by CCID's Outside Canal between the headworks of the canal at Mendota Pool and the upper (southern) end of the proposed well field (Section 1) no change in water quality is anticipated since there is no Proposed Action pumping in this reach. No change in quality would occur in the Main Canal from its headworks at Mendota Pool to a downstream location where its flow commingles with flow originating from the Outside Canal through the O'Banion Bypass. Modeled Main Canal operations result in a positive flow past Section 2 and Section 3a at Russell Avenue in all years. These model sections are assumed to serve CCID's southern service area agricultural customers.
- **Outside Canal Adjacent to Proposed Action Well Field.** The Proposed Action well field adjacent to the Outside Canal is assumed to be situated from approximately the Firebaugh Wasteway, north to mid-way between Fairfax and Laguna avenues. The area is represented by Section 2 of the model. The water delivered from Outside Canal in this area would be affected by Proposed Action pumping into the canal within Section 2. The projected change in water quality within Section 2 is shown in Table 4.4-4.

Table 4.4-4. Projected Water Quality of Outside Canal Adjacent to Well Field with Proposed Action

EC - uS/cm	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
No-action												
Wet		506	507	468	479	415	345	374	396	399	502	
Above Normal		556	549	471	480	458	366	383	395	493	554	
Below Normal		557	551	477	484	458	376	388	479	538	562	
Dry		621	627	560	489	458	381	493	614	601	574	
Critical		767	822	897	891	776	796	703	703	692	744	
Action												
Wet		506	739	727	734	733	733	735	743	721	502	
Above Normal		556	754	753	763	762	761	753	755	753	554	
Below Normal		557	779	782	781	771	770	778	768	781	562	
Dry		621	826	833	813	819	833	821	831	825	574	
Critical		767	1,185	1,173	1,179	1,188	1,181	1,183	1,168	1,162	744	
Difference												
Wet		0	232	259	255	318	388	362	347	322	0	
Above Normal		0	205	282	283	303	395	371	360	260	0	
Below Normal		0	228	305	297	313	394	389	289	242	0	
Dry		0	199	273	324	360	452	328	217	224	0	
Critical		0	363	276	288	412	385	480	465	470	0	

The results illustrate achieving the operational objective to provide a generally constant level of quality for the water delivered to the area during the period of Proposed Action pumping. Results are not shown for January and December, as it is assumed that the Outside Canal or Mendota Pool would undergo maintenance during that period of time.

Proposed Action pumping has been assumed to be scheduled during the March through October period. Best water quality is projected to occur during wet years with the quality

estimated to be approximately 730 uS/cm EC (470 TDS), decreasing in quality in drier years to approximately 830 uS/cm EC (530 TDS).

During critical years it is projected that water quality could reach 1,180 uS/cm EC (755 TDS). The critical year result is affected by both the lesser water quality available at the Mendota Pool and by the Proposed Action pumping affecting a smaller amount of canal diversions during critical years.

- **Outside Canal downstream of Well Field.** CCID deliveries from Outside Canal downstream of the well field cease until reaching a location downstream of the O'Banion Bypass. Modeled operations for the Outside Canal indicate a positive flow downstream of the well field in all years, except when there is no flow in the canal due to maintenance during January and December. The quality of the water in Outside Canal downstream of the well field would be approximately the same as the quality leaving Section 2 (shown in Table 4.4-4). The flow in the Outside Canal is assumed to be diverted to the Main Canal through the O'Banion Bypass up to a rate of 50 cfs, with any remaining flow continuing downstream in the Outside Canal.

  Table 4.4-5 shows the modeled flow in the Outside Canal just upstream of the O'Banion Bypass. The first 50 cfs of this flow is assumed to be diverted through O'Banion Bypass to the Main Canal. The remainder of the flow would continue downstream in the Outside Canal. The location at which the flow in the Outside Canal transitions from being supplied from Mendota Pool to being supplied from DMC Milepost 76.05 (Wolfsen Bypass) would vary. No supplies enter the Outside Canal between the downstream location of the well field and O'Banion Bypass which results in the water quality at this location being the same as shown in Table 4.4-4.

Table 4.4-5. Outside Canal Flow upstream of O'Banion Bypass

Flow - cfs	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
No Action												
Wet	0	114	93	95	135	225	181	212	233	237	115	0
Above Normal	0	114	93	95	135	225	181	212	233	237	115	0
Below Normal	0	114	93	95	135	225	181	212	233	237	115	0
Dry	0	114	93	95	135	225	181	212	233	237	115	0
Critical	0	90	74	76	119	151	167	170	212	156	90	0
Action												
Wet	0	114	93	95	135	225	181	212	233	237	115	0
Above Normal	0	114	93	95	135	225	181	212	233	237	115	0
Below Normal	0	114	93	95	135	225	181	212	233	237	115	0
Dry	0	114	93	95	135	225	181	212	233	237	115	0
Critical	0	90	74	76	119	151	167	170	35	156	90	0
Difference												
Wet		0	0	0	0	0	0	0	0	0	0	
Above Normal		0	0	0	0	0	0	0	0	0	0	
Below Normal		0	0	0	0	0	0	0	0	0	0	
Dry		0	0	0	0	0	0	0	0	0	0	
Critical		0	0	0	0	0	0	0	-176	0	0	

The flow in the Outside Canal upstream of the O'Banion Bypass location is the same in the No Action and Proposed Action scenarios except for one instance in critical years. During that period CCID diversions were shifted in September from the Outside Canal to the Main Canal with a compensating shift in pumping to other months to achieve the directed water quality effect along the Outside Canal while minimizing the effect on

Main Canal deliveries. The quality of the flow remaining in the Outside Canal would be approximately the same as shown in Table 4.4-4 until fully depleted by downstream deliveries.

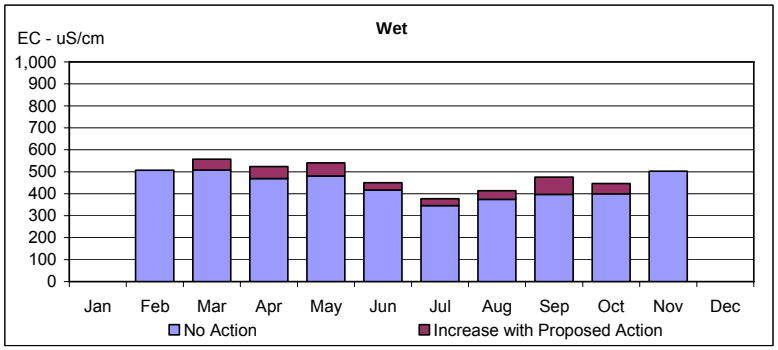
The results illustrate the potential flexibility in pumping strategy that could provide a managed range of water quality during the year. Flexibility would be available in shifting pumping and canal diversions from period-to-period, and among the canals to achieve desired delivered water quality conditions. An increase in pumping rate capacity for the Proposed Action could provide additional flexibility to blending operations.

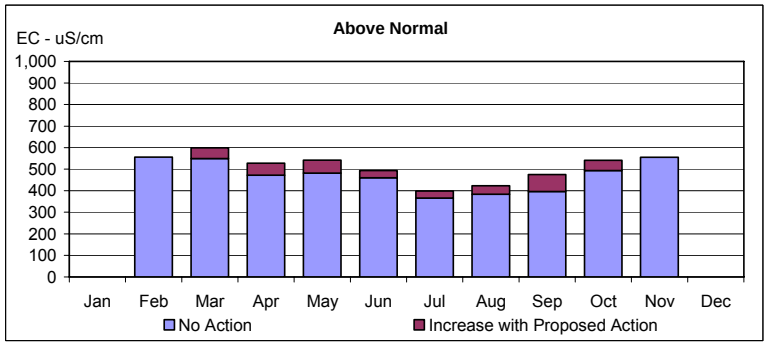
- **Main Canal below Russell Avenue.** The Main Canal is disaggregated into two areas representing Section 3. Section 3a represents an area downstream of the well field where the deliveries are associated with CCID's agriculture irrigators. This area is generally downstream of Fairfax Avenue and ends approximately at Russell Avenue. Section 3b represents the area downstream of Section 3a and continues to the O'Banion Bypass. Within this area deliveries occur to the Grassland Water District. The water quality of flow leaving Section 3a would be generally indicative of diversions from Mendota Pool (see Table 3 in Appendix D) and would be unaffected by the Proposed Action. The projected water quality in Section 3b for the No Action and the Proposed Action would also be the same. During January and December when maintenance may occur upstream of Section 3b, water may be delivered to the area from O'Banion Bypass; but these deliveries would be unaffected by the Proposed Action since headwork diversions and Proposed Action pumping are not occurring.

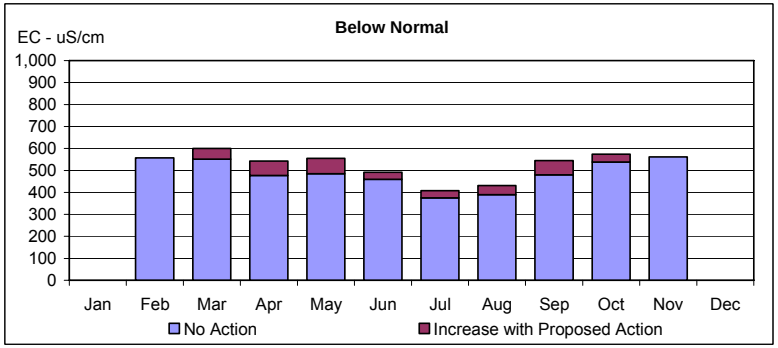
  There normally would be a positive flow of water past Section 3b, with supplemental flow from the O'Banion Bypass adding to the supply of the Main Canal for downstream deliveries. As described above flow from the O'Banion Bypass comes from the Outside Canal either originating from the Mendota Pool or, when no flow is available from upstream Outside Canal, from the DMC via the Outside Canal from the Wolfsen Bypass. The quality of the water in Main Canal below the O'Banion Bypass with and without the Proposed Action is shown in Table 4.4-6, and illustrated in Figure 4.4-2.

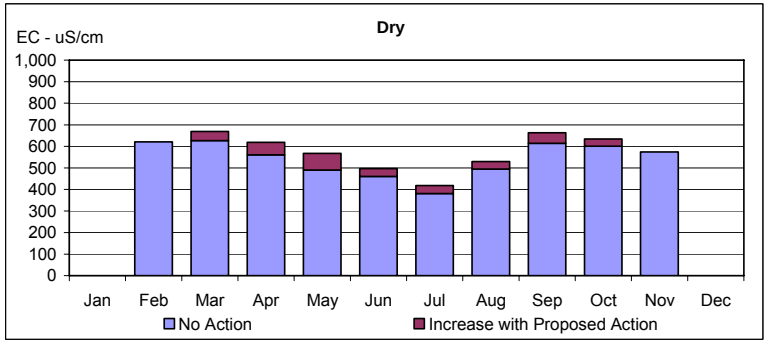
Table 4.4-6. Main Canal below O'Banion Bypass Water Quality

EC - uS/cm	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
No Action												
Wet		507	508	469	481	417	346	375	397	400	502	
Above Normal		556	549	472	481	460	366	384	396	493	555	
Below Normal		557	552	477	486	460	376	390	480	539	562	
Dry		621	627	560	490	460	381	494	614	601	574	
Critical		766	821	894	889	774	793	702	703	691	743	
Action												
Wet		507	558	524	541	450	377	414	476	447	502	
Above Normal		556	593	532	548	491	398	424	478	531	555	
Below Normal		557	600	542	556	492	408	432	545	574	562	
Dry		621	669	619	567	497	418	529	663	634	574	
Critical		766	913	965	968	832	841	773	769	743	743	
Difference												
Wet		0	50	55	60	33	32	39	79	47	0	
Above Normal		0	44	60	67	31	32	40	82	38	0	
Below Normal		0	49	65	70	32	32	42	66	35	0	
Dry		0	43	58	77	37	37	35	49	33	0	
Critical		0	93	70	79	59	47	71	66	52	0	









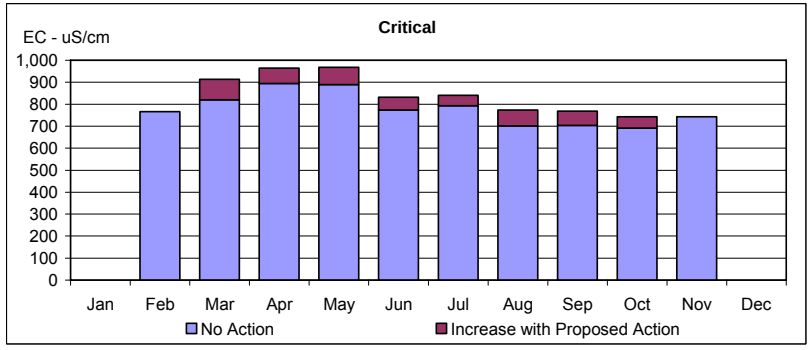


Figure 4.4-2. Main Canal below O'Banion Bypass Water Quality

Generally the flow in Main Canal below O'Banion Bypass, and consequently to downstream users including some wildlife management areas, could experience a lessening in water quality due to the Proposed Action ranging between 30 and 70 uS/cm EC (20-50 ppm TDS) during March through October during non-critical years, and up to 90 uS/cm EC (approximately 65 ppm TDS) during critical years. These fluctuations would occur within the context of existing conditions where daily fluctuations in water quality from water deliveries from the Delta-Mendota Canal vary widely, from minimal to 1,000 uS/cm EC (approximately 700 ppm TDS). The small water quality effect could be alternatively managed by the flexibility available to shift pumping from month-to-month, and by alternatively managing the diversions at CCID's Outside and Main Canals and flow through the O'Banion Bypass.

Additional Water Quality Effects

CCID is geographically and conveyance interconnected to other lands and purveyors in the area. Its operations in relation to surface water resources in the region are described in the EIS/EIR titled "Water Transfer Program for the San Joaquin River Exchange Contractors Water Authority 2005-2014," dated December 2004 (Transfer Report). A change in the quality of water delivered by CCID could have a varying effect to areas within and adjacent to CCID.

The results of this analysis indicate the changes in water quality that could occur to water delivered at various locations along CCID's system, and have been illustrated above. The effect of these changes within the disposition of the delivered water is described as follows.

- **Deliveries Adjacent to Section 1.** For areas receiving water from CCID's Main Canal in Section 1 and other diversions from the Mendota Pool, there would be no change in water quality since Proposed Action pumping enters CCID's system downstream of these locales.
- **Deliveries Adjacent to Section 2.** The delivery area of Outside Canal in Section 2 is downslope-bound by the Main Canal and thus surface water within this area is isolated from adjacent areas. Surface water deliveries are applied to the lands with percolation occurring to the groundwater. Surface water tailwater within the area, although minor, is captured by CCID through re-lift pumping into the Main Canal. At the peak of the irrigation season, the re-lift of tailwater may be 2-3 percent of the flow in the Main Canal, and degrades the quality of water in the Main Canal by less than 5 uS/cm (without the Proposed Action). The lessening of water quality in surface water supply to the area (generally a maximum degradation of less than 400 uS/cm EC, see Table 4.4-4) with subsequently affected tailwater from this source would not change this result.

  Major deliveries by CCID from the Main Canal in Section 2 include releases to the Parsons Canal and Colony Main Canal. These canal systems serve areas in CCID's southern area. Since the water quality in the Main Canal in Section 2 is unaffected by the Proposed Action no change in the source water of CCID's southern area would occur.
- **Deliveries Adjacent to Section 3.** The delivery area of Outside Canal in Section 3 is also downslope-bound by the Main Canal and thus also isolated from adjacent areas. The deliveries in this area are about 50 cfs during the peak of the irrigation season. Surface

water deliveries are applied to the lands, with percolation occurring to the groundwater. No tailwater in this area is currently captured by CCID through re-lift pumping into the Main Canal, thus any effect caused by a lessening in the quality of the water source supply to this area (generally a maximum degradation of less than 400 uS/cm EC) manifests within the area's lands. Deliveries of water from the Main Canal in Section 3a and Section 3b would be unaffected.

- **Deliveries Below O'Banion Bypass.** As described previously, water in the Outside Canal that originates from Mendota Pool and is degraded by the Proposed Action pumping may at times continue downstream of O'Banion Bypass for some distance until depleted by deliveries in CCID's northern area. The areas served with this water are upslope of the Main Canal, and except for tailwater re-lift pumping into the Main Canal (minor in quantity) would not affect other surface water resources.

  The quality of water deliveries from the Main Canal below O'Banion Bypass is projected to be affected by the Proposed Action (see Table 4.4-6). The effect could be a degradation of quality ranging from minimal to about 90 uS/cm EC which is well within the context of daily fluctuations in the quality of water delivered from the DMC. Agricultural lands receiving this water (CCID's northern area) have little or no surface water connectivity with the San Joaquin River (see Transfer Report). The additional loading from the supplies would have effects that manifest within the area's lands.

- **San Joaquin River Outfalls.** Since the Proposed Action does not affect the quality of water provided to CCID's southern area or the wildlife management areas served adjacent to CCID's southern area, nor does the quality of water used by other diverters of Mendota Pool change, there is no change in water quality anticipated to the outflow of water from the area to the San Joaquin River.

Water Receiving Areas

The additional water deliveries to the San Luis Unit and SCVWD for agricultural and M&I uses would have no impacts to surface water resources in the receiving areas, because contract allocations and totals, points of diversion, and water measurements would not differ substantially from existing conditions and No Action. Any new water for M&I uses, that could result in land use changes, would not be made available until appropriate NEPA/CEQA and ESA/CESA compliance is accomplished (see Section 2.4).

4.4.2.3 CEQA Checklist for Groundwater and Surface Water Resources

VIII. HYDROLOGY AND WATER QUALITY	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less than Significant Impact	No Impact
Would the project:				
a) Violate any water quality standards or waste discharge requirements?			✓	

VIII. HYDROLOGY AND WATER QUALITY	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less than Significant Impact	No Impact
b) Substantially deplete groundwater supplies or interfere substantially with groundwater recharge such that there would be a net deficit in aquifer volume or a lowering of the local groundwater table level (e.g., the production rate of pre-existing nearby wells would drop to a level that would not support existing land uses or planned uses for which permits have been granted)?			✓	
c) Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, in a manner that would result in substantial erosion or siltation on- or off-site?				✓
d) Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, or substantially increase the rate or amount of surface runoff in a manner that would result in flooding on- or off-site?				✓
e) Create or contribute runoff water that would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff?			✓	
f) Otherwise substantially degrade water quality?			✓	
g) Place housing within a 100-year flood hazard area as mapped on a Federal Flood Hazard Boundary or Flood Insurance Rate Map or other flood hazard delineation map?				✓
h) Place within a 100-year flood hazard area structures that would impede or redirect flood flows?				✓

VIII. HYDROLOGY AND WATER QUALITY	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less than Significant Impact	No Impact
i) Expose people or structures to a significant risk of loss, injury or death involving flooding, including flooding as a result of the failure of a levee or dam?				✓
j) Inundation by seiche, tsunami, or mudflow?				✓

Discussion:

a) The Proposed Action does not result in violations of specific standards within the project area. Since the Proposed Action does not affect the quality of water provided to CCID's southern area or the wildlife management areas served adjacent to CCID's southern area, nor does the quality of water used by other diverters of Mendota Pool change, there is no change in water quality anticipated to the outflow of water from the area to the San Joaquin River. In addition, the Proposed Action would simultaneously reduce tile drainage discharge by up to approximately 135 AFY (101 AFY on average) due to the lowering of the shallow groundwater table from groundwater pumping and, therefore, produce a beneficial effect that is less than significant.

b) The proposed pumping would result in maximum drawdowns in the well field of less than 115 to 125 feet, and these drawdowns would not compromise the pumping rates proposed. At the end of the eight month pumping period, the drawdowns in the well field would range from less than 65 to 90 feet, and these estimates do not reflect recharge of the upper aquifer that would occur. The resulting decreased outflow of poor quality groundwater into other parts of CCID and Madera County would be a beneficial effect. Subsidence due to the proposed pumping would be less than 0.2 foot, and this subsidence would not substantially affect canals or other structures in the area. The reduction in downward flow of groundwater to the lower aquifer (less than 700 AFY) would be small compared to pumpage from the lower aquifer in adjoining areas.

c) There is no alteration of the existing surface drainage pattern. The canals and ditches would continue to make deliveries as prior to the Proposed Action, and total water deliveries would remain the same.

d) See item c above.

e) See response c above. Concerning polluted runoff, tailwater recovery systems would continue to operate. The delivered water within CCID would be of higher salinity, but the difference is not enough to impair agricultural production. Outfall flows that would reach the San Joaquin River would have no change in water quality.

f) See item e above. No selenium discharges would result from the Proposed Action.

g) The Proposed Action does not involve construction of any housing.

h) The only construction would be to install 15 wells and pumps which would not impede flood flows.

i) The Proposed Action would not alter any levees or dams. The pumped groundwater would be piped to the canals.

j) Groundwater wells and pumps would not expose people or property to these seismic hazards.

4.4.3 Alternative Action – Groundwater Pumping Only

As with the Proposed Action, the Alternative Action consists of pumping up to 15,000 AF of groundwater into the Outside Canal, blending that groundwater in the canal and delivering the blended water to downstream locations.

4.4.3.1 Groundwater Resources

Effects are the same as the Proposed Action with the same amount of pumping proposed (only 15,000 AF).

4.4.3.2 Surface Water Resources

The effects on surface water resources are the same as the Proposed Action for the water development areas. Less water would be available for delivery to the receiving area districts, and the conclusion of no impact also applies to this alternative.

4.4.4 Alternative Action without Groundwater Pumping

The Alternative Action without Groundwater Pumping involves use of conservation measures (canal lining and drip irrigation) and temporary land fallowing to develop water for transfer.

4.4.4.1 Groundwater Resources

Canal lining and drip irrigation would reduce groundwater recharge. Temporary land fallowing would reduce application of irrigation water locally which would lower the water table in the affected areas.

4.4.4.2 Surface Water Resources

The Alternative Action would develop water in ways that would not introduce water sources of lesser water quality into the delivery system. This circumstance would also not result in any change in water quality delivered within the area and subsequently no change to surface water resources. Lands contemplated to be fallowed are in areas that do not have surface water continuity with downslope surface water; thus also there would be no impacts to current water resources.

The additional water deliveries to the San Luis Unit and SCVWD for agricultural and M&I uses would have no impacts to surface water resources in the receiving areas, because contract totals, points of diversion, and water measurements would not differ substantially from existing conditions and No Action. Any new water for M&I uses would not be made available until NEPA/CEQA and ESA/CESA compliance is accomplished.

4.4.5 Cumulative Effects

A cumulative impact analysis takes into consideration impacts that may be created as a result of combining the Proposed Action or Action Alternatives with other related programs or projects that have impacts. At issue is whether there is a considerable cumulative effect on ground- or surface waters. Although the Proposed Action's incremental impacts from the 1) installation and operation of groundwater wells and pumps and 2) additional water deliveries over recent allocations under the CVP Water Shortage Policy are individually limited, could they be considered cumulatively considerable when considered with other plans, projects, and programs within the project area and vicinity? The conclusion is that they are not cumulatively considerable, as explained below.

4.4.5.1 Groundwater Resources

The incremental effects of the Proposed Action combined with associated effects in the water development area are not adverse or significant. The effect of pumping associated with other urban and agricultural activities in Madera County has been overdraft of groundwater resources and migration of poor quality groundwater into CCID and Madera County. The Proposed Action and one Alternative Action would reduce the northeasterly migration of poor quality groundwater and lessen the deterioration of well water quality in these areas. In this manner, these two Action Alternatives do not contribute to a cumulatively considerable impact. The Alternative Action without Groundwater Pumping would reduce the percolation of irrigation water to groundwater due to the conservation measures, and it would eventually lessen migration of poor quality groundwater.

The water receiving areas' long-term contract renewal water supplies, when considered in combination with other past, present, and reasonably foreseeable future actions and projects, are unlikely to result in further adverse cumulative impacts to groundwater levels and quality when compared to the No Action Alternative and existing conditions in the San Luis Unit.

Much of the cumulative effects arising from the combination of long-term contract renewals and other past and present activities have already occurred and are documented in the San Luis Unit Draft EIS as existing conditions and ongoing trends within the Affected Environment and/or No Action Alternative descriptions (Reclamation 2005c). The cumulative effects of the long-term contract renewals and the continued application of irrigation water to agricultural lands (and for M&I purposes) will contribute indirectly to the continuation of current groundwater conditions and future trends as a result of decisions to be made regarding the levels of deliveries that the CVP can provide as the CVPIA continues to be implemented. This is particularly true when considering cumulative impacts resulting from all other CVP projects under analysis in the OCAP in combination with long-term contract renewals and water transfers—levels of deliveries will dictate potential levels of irrigation applications, which will in turn increase the amount of potential adverse groundwater impacts within San Luis Unit. If deliveries are curtailed, such effects will likely be proportionally reduced to the extent they are directly related to irrigation applications. Future drainage management, habitat restoration, land acquisition, land retirement, water conservation, and related CVP programs are expected individually and in combination with long-term contract renewals to reduce cumulative drainage and water quality impacts to receiving waters if implemented as intended. (Reclamation 2005c)

4.4.5.2 Surface Water Resources

The incremental effects of the Proposed Action, combined with associated effects, on water quality (i.e., on salt loads) are not significant and do not affect other water users. However, water quality problems in the San Joaquin River watershed are well known and result from a variety of land uses: urban runoff, agricultural discharges from irrigation practices, and discharges from wetlands and wildlife refuges. Water quality regulatory requirements and projects affecting the San Joaquin River include the SWRCB Decision 1641, the New Melones Interim Operation Plan, Level 4 wildlife area water deliveries, the San Joaquin River Agreement (inclusive of VAMP), the Grassland Bypass Project through 2009, salt and boron TMDLS from the CVRWQCB, the TMDL for dissolved oxygen in the Stockton Deep Water Ship Channel, the RWQCB irrigated lands conditional waiver, the Westside Regional Drainage Plan, and the San Luis Drainage Feature Re-evaluation. Within this context of future discharge projects and programs to improve water quality, the incremental beneficial impact of the reduction in drainage discharge is not cumulatively considerable.

Long-term contract renewals and the proposed water transfer, when added to other past, present, and reasonably foreseeable future actions, will not create any additional cumulative impacts on surface water resources or quality. Water deliveries to San Luis Unit contractors will be but one of many competing demands on surface water resources available for diversion and delivery. Agricultural sources of sedimentation, siltation and selenium affecting receiving waters will continue to be supported by some CVP surface water deliveries (Reclamation 2005c).

4.4.6 Monitoring

Although there are no significant impacts to either groundwater or surface water that would require mitigation, the following monitoring measures are included as part of the Proposed Action for groundwater. For surface water, existing monitoring programs are sufficient to identify water quality conditions for CCID and FCWD discharges to ensure compliance with current programs.

4.4.6.1 Groundwater

There are no significant impacts that would require mitigation; however, there is an existing monitoring program that would be enlarged to track effects, if any, of the proposed pumping program on:

- The quality of downstream canal water.
- Shallow groundwater levels.
- Water levels in existing supply wells.
- Flows in drain sumps.
- Land surface subsidence.

Canals

Two additional sampling points would be developed for the Main Canal and two more for the Outside Canal. One set would be up-stream of the most upstream proposed well discharge

into each of the canals. The other set would be downstream of the most down-stream proposed well discharge into each of the canals. The same sampling frequency and constituents determined would be used as for the existing program.

Shallow Observation Wells

Measurements for the existing monitoring would continue, except one round of water-level measurements would be made just before pumping starts, and another during the last week of pumping.

Project Supply Wells

Flowmeters would be installed on each of these wells and read weekly during the duration of pumping. Static water levels in each well would be measured in the spring and fall, and also just prior to the commencement of pumping from these wells each year. Pumping levels would be measured in these wells on a monthly basis during pumping periods. Water samples would be collected near the end of the peak pumping period from each well for irrigation suitability and selenium analyses. Monthly samples would be analyzed for electrical conductivity. Annual technical reports would be prepared on the results of monitoring, including any necessary revisions in the monitoring program.

4.4.6.2 Surface Water

This analysis indicates that with the Proposed Action there would be no contributions to San Joaquin River salinity. Furthermore, directly attributed to the Proposed Action pumping would be a reduction in tile drainage discharge due to a lowering of groundwater in the area. This direct reduction in drainage flow is estimated to approach 135 AFY (see Appendix A with 180 AF for 20,000 AF level of pumping). This reduction in drainage discharge is a beneficial effect. Within the context of future discharge conditions in the area, the incidental reduction in salinity loading by the Westside Drainage Plan program to eliminate current discharges of selenium would provide additional water quality improvement. This program involves extensive water quality monitoring, by the Exchange Contractors. Furthermore, the Exchange Contractors' Water Transfer Policy Relating to Drainage Projects (September 2004) calls for maintenance and implementation of long-term monitoring. Consequently, no additional monitoring of surface water outflows is needed.

4.5 Land Use

The Proposed Action involves pumping 15,000 AF of groundwater by utilizing new and existing wells adjacent to the CCID Outside and Main Canals,. The community of Firebaugh is adjacent to the proposed well field. There are two main land use issues of concern: 1) local issue of land use compatibility with agriculture and near the community of Firebaugh and 2) the regional issues of supporting agriculture and land conversion. Significance criteria used to evaluate agricultural and recreational land use impacts from the proposed water supply/water transfer project include:

- If the project converts Prime Farmland, Unique Farmland, or Farmland of Statewide Importance (as shown on the maps prepared pursuant to the Farmland Mapping and Monitoring Program of the California Resources Agency), to non-agricultural use.
- If the project conflicts with existing zoning for agricultural use, or a Williamson Act contract.
- If the project involves other changes in the existing environment which, due to their location or nature, could result in conversion of Farmland, to non-agricultural use.
- If the project physically divides an established community.
- If the project conflicts with any applicable land use plan, policy, or regulation of an agency with jurisdiction over the project (including, but not limited to the general plan, specific plan, local coastal program, or zoning ordinance) adopted for the purpose of avoiding or mitigating an environmental effect.
- If the project conflicts with any applicable HCP or natural community conservation plan.
- If the project increases the use of existing neighborhood and regional parks or other recreational facilities such that substantial physical deterioration of the facility would occur or be accelerated.
- If the project includes recreational facilities or requires the construction or expansion of recreational facilities that might have an adverse physical effect on the environment.

The proposed groundwater pumping/water transfer project would not result in any significant impacts to land, agriculture, or recreation uses, as no physical changes would be made to these uses and the proposed groundwater pumping water transfer would allow agricultural land to remain in production. Water deliveries to existing uses would not stimulate land conversion or urban growth (see Section 2.4).

4.5.1 No Action

Environmental consequences for the No Action Alternative are analyzed based on the expected physical changes and related land use implications at the end of the 25-year project timeframe, relative to the existing conditions. Without the proposed groundwater pumping/water transfer project, land and agricultural uses may change as a result of 28,000 acres of agricultural land going out of production due to shallow groundwater affecting the root zone of crops. Furthermore, water supply shortages in the receiving areas could exacerbate the conversion of agricultural lands to other, nonagricultural uses. This would potentially be inconsistent with the Fresno County General Plan (County of Fresno 2000), according to Policy LU-A.1, which mandates that Fresno County maintain agriculturally-designated areas for agriculture use and direct urban growth away from valuable agricultural lands. See Section 4.6.1 for the adverse long-term effects of No Action on agricultural production.

The San Luis Unit DEIS concludes that the Preferred Alternative involves a tiered pricing program that is based on the full current contract amount of water and the price structure included in the No Action Alternative. Therefore, the Preferred Alternative with respect to agricultural production in the San Luis Unit would be similar to the No Action Alternative.

Tiered pricing for the No Action Alternative is based on the current contract amount of water. Contractors may purchase, as available, 80 percent of their full contract amount at the basic Contract Rate (Tier 1). The next 10 percent of the full contract amount (Tier 2) is priced at the midpoint between the basic Contract Rate and the Full Cost Rate (as defined in the Reclamation Reform Act). The last 10 percent of the full contract amount (Tier 3) is priced at the Full Cost Rate. (Reclamation 2005c)

Under the Preferred Alternative, there would be no impacts to agricultural production in the San Luis Unit when compared to existing conditions or the No Action Alternative. Agricultural resource use resulting from this alternative is assumed to be similar to the No Action Alternative because, as described in Table 4.5-1, the amount of water delivered, the timing of those deliveries, and the rates and method of payment for water delivered under the Preferred Alternative do not substantially differ from the No Action Alternative. (Reclamation 2005c)

Table 4.5-1. No Action Alternative Irrigated Acreage by CVPM Subregion and Crop (thousands of acres)

CVPM Subregion	Crop Category	Average Water Year	Wet Water Year	Dry Water Year
10	Pasture	13.3	13.3	13.3
	Alfalfa	40.8	40.9	40.8
	Sugar Beets	13.9	13.9	13.9
	Other Field Crops	48.2	48.2	48.3
	Rice	2.9	2.9	2.9
	Truck Crops	112.9	112.9	113.0
	Tomatoes	40.2	40.2	40.2
	Deciduous Orchard	36.6	36.6	36.6
	Small Grain	14.0	14.0	14.0
	Grapes	1.0	1.0	1.0
	Cotton	103.1	103.1	103.1
	Subtropical Orchard	0.1	0.1	0.1
	Subtotal	*427.0*	*427.1*	*427.2*
14	Pasture	0.1	0.1	0.1
	Alfalfa	14.0	14.0	13.4
	Sugar Beets	4.8	4.8	4.8
	Other Field Crops	18.4	18.3	17.9
	Truck Crops	136.4	136.4	136.2
	Tomatoes	77.0	77.0	76.2
	Deciduous Orchard	24.9	24.9	24.9
	Small Grain	10.4	10.4	9.7
	Grapes	7.0	7.0	7.0
	Cotton	206.5	206.6	198.8
	Subtropical Orchard	1.0	1.0	1.0
	Subtotal	*500.5*	*500.5*	*490.0*
Total—All Subregions		**927.5**	**927.6**	**917.2**

Source: CH2M Hill 2000, Reclamation 2005

The DEIS Preferred Alternative would not result in adverse impacts to land use in the San Luis Unit when compared to existing conditions. The long-term provision of CVP water to the study area would only continue to provide CVP water supplies that accommodate a portion of the planned populations and land uses that are identified in the three counties' general planning documents. The renewal of the long-term contracts would continue the water supply for agricultural and crop production and, therefore, would contribute to the continued production of these lands. Implementation of the Preferred Alternative (Reclamation 2005c) would not directly impact the continued production of agricultural crops or impair the productivity of important farmlands when combined with drainage control measures in drainage impaired areas not planned for land retirement.

The Preferred Alternative would not result in adverse impacts on recreational resources in the San Luis Unit when compared to existing conditions or the No Action Alternative. The facilities would continue to operate as in the past and present, with deliveries and water levels generally approximating estimates now projected for San Luis Reservoir. Recreational opportunities and annual use levels at the San Luis, Los Banos, and Panoche Reservoirs, state recreation areas, the O'Neill Forebay, San Luis Canal, San Joaquin River, and parks and wildlife refuges are not expected to change from current or No Action Alternative conditions as a result of the long-term contract renewals. (Reclamation 2005c)

4.5.2 Proposed Action

4.5.2.1 Water Development Area

The Proposed Action would affect the areas developing the water for transfer (CCID and FCWA) and the water receiving areas (Fresno, Merced, Kings, Santa Clara, and Stanislaus counties). No urban development is proposed under this action. Construction would only occur in the proposed well field, which is located close to the community of Firebaugh. Therefore, two key issues exist relating to land use. 1) the compatibility of the Proposed Action with land uses near the community of Firebaugh and 2) the regional issue of the Proposed Action supporting agriculture and urban in the water receiving areas.

The Proposed Action utilizes blended groundwater and surface water to allow CCID agricultural lands to remain in production and transfers Delta-Mendota Canal water to other CVP water receiving areas. The transfer to the receiving areas supports existing farmlands and minimizes the potential for the conversion of agricultural land to other uses. The Proposed Action would therefore be consistent with Policy LU-A.1 of the Fresno County General Plan.

The construction of the proposed well field would occur just outside of Firebaugh. The well field would not divide Firebaugh. Construction and operation of the groundwater wells would also not affect recreation opportunities, as the proposed well field would be located outside of Firebaugh, where no existing recreation facilities are located.

Indian Trust Assets

No Indian Trust Assets (ITAs) are located within the well development area, so there is no impact.

4.5.2.2 Water Receiving Areas

The proposed water transfers to San Luis Unit and SCVWD, up to 20,000 AFY, would assist in meeting water demands of existing agricultural and M&I water users and in improved water supply reliability. No new lands would be brought into production. The additional water could substitute for groundwater or other source of supply. For any potential M&I deliveries beyond recent CVP contract allocations and amounts that would serve new development or users, appropriate NEPA/CEQA and ESA/CESA compliance would be required by Reclamation prior to completion of any transfer agreements such that there would be no adverse effects and any land use changes would be consistent with local land use policies. For the San Luis Water District, only 2,000 AFY has sufficient reliability for M&I purposes. An additional 3,000 AFY could be transferred under Phase 2 with the compliance measures identified above (see Section 2.4).

4.5.2.3 CEQA Checklist for Land Uses

II. AGRICULTURAL RESOURCES	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less than Significant Impact	No Impact
In determining whether impacts to agricultural resources are significant environmental effects, lead agencies may refer to the California Agricultural Land Evaluation and Site Assessment Model (1997) prepared by the California Dept. of Conservation as an optional model to use in assessing impacts on agriculture and farmland. Would the project:				
a) Convert Prime Farmland, Unique Farmland, or Farmland of Statewide Importance (Farmland), as shown on the maps prepared pursuant to the Farmland Mapping and Monitoring Program of the California Resources Agency, to non-agricultural use?				✓
b) Conflict with existing zoning for agricultural use, or a Williamson Act contract?				✓
c) Involve other changes in the existing environment which, due to their location or nature, could result in conversion of Farmland, to non-agricultural use?			✓	

Discussion:

a) The Proposed Action would not convert farmland to other uses in the water development area. The proposed water transfer utilizes pumped water for use on CCID agricultural lands and transfers Delta-Mendota Canal water to the other CVP water users/receiving areas. These actions support existing farmlands and minimize the potential for their retirement and conversion to other uses. The proposed water transfers to San Luis Unit and SCVWD would assist in meeting water demands of existing agricultural and M&I water users and in improved water supply reliability. For any deliveries beyond recent

CVP contract allocations and amounts that would serve new development or users, appropriate NEPA/CEQA and ESA/CESA compliance would be required by Reclamation prior to completion of any transfer agreements such that there would be no adverse effects and any land use changes would be consistent with local land use policies.

b) The Proposed Action would not conflict with existing agricultural land uses, as the blended water would be used to irrigate existing CCID agricultural areas. There would be no reduction in water supply to CCID farmers.

c) See item a above.

IX. LAND USE AND PLANNING	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less than Significant Impact	No Impact
Would the project:				
a) Physically divide an established community?				✓
b) Conflict with any applicable land use plan, policy, or regulation of an agency with jurisdiction over the project (including, but not limited to the general plan, specific plan, local coastal program, or zoning ordinance) adopted for the purpose of avoiding or mitigating an environmental effect?				✓
c) Conflict with any applicable HCP or natural community conservation plan?			✓	

Discussion:

a) The Proposed Action would not result in dividing an established community. The area of construction for the proposed wells would not occur in an established community; rather, it occurs adjacent to canals and cultivated lands. Agricultural land use would not change as a result of the Proposed Action.

b) In terms of land use, the Proposed Action would be consistent with Policy LU-A.1, of the Fresno County General Plan (Fresno County 2000). Other examples of consistency with the Fresno County General Plan include Goal OS-A (groundwater pumping improves quality of groundwater migrating into Madera County) and Goal OS-J and Policy OS-J.1 (conducting CEQA review of historical, archeological, paleontological, and cultural sites for potential impacts and implementing mitigation, if applicable).

c) No known HCPs have been or are being developed for the water development area. The HCPs for the receiving areas have not been finalized, but it is not anticipated that the Proposed Action would result in conflicts with upcoming HCPs in Santa Clara County and in the San Luis Unit counties due to measures expected to be incorporated into the HCPs based on issues raised in the long-term contract renewal NEPA documents.

XIV. RECREATION	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less than Significant Impact	No Impact
Would the project:				
a) Increase the use of existing neighborhood and regional parks or other recreational facilities such that substantial physical deterioration of the facility would occur or be accelerated?				✓
b) Does the project include recreational facilities or require the construction or expansion of recreational facilities that might have an adverse physical effect on the environment?				✓

Discussion:

a) The proposed groundwater pumping/water transfer project does not result in an impact to recreational facilities. Although there are wildlife refuges downstream of the water development area and canals where blending would occur, fishing and wildlife viewing activities at the refuges would not be affected. The construction and operation of the groundwater wells would not affect the recreation opportunities in the project area and vicinity. Therefore, existing neighborhood or regional parks, or other recreation facilities outside of the water development area or in the water receiving areas would not be affected by the Proposed Action.

b) No new recreational facilities would be developed. See item a.

4.5.3 Alternative Action – Groundwater Pumping Only

Similar to the Proposed Action, there are no significant impacts to agriculture, recreation, or other land uses.

4.5.4 Alternative Action without Groundwater Pumping

Similar to the Proposed Action, no impacts of significance are associated with the Alternative Action. Land uses would not change, farmland would remain in production (except for the 5,400 acres of rotational, temporary land fallowing), and recreational facilities would not be created nor impacted by the Alternative Action.

4.5.5 Cumulative Effects and Growth Inducement

There are no incremental impacts from supporting agricultural production on the affected lands which are currently under cultivation. The regional trend of conversion of agricultural land to other uses, especially urban uses, would not be exacerbated by any of the Action Alternatives.

Overall, the cumulative impacts of renewing long-term water service contracts (under No Action) can be both beneficial and potentially adverse to agricultural resources. In the long-term, the renewal of long-term water service and repayment contracts is beneficial in light of past projects that have assisted growers in bringing marginal lands into irrigation and production, including the statutory authorities for long-term contract renewals listed at the start of Chapter 1 in the DEIS.[5] (Reclamation 2005c)

Continued provision of water (including the proposed transfer) to agricultural and M&I users in the San Luis Unit and SCVWD beneficially supports the ongoing production of food, fiber, and other agricultural resources that sustain the regional, subregional, and local economies.

In contrast, some aspects of long-term contract renewal for the San Luis Unit may have adverse short-term effects on the agricultural viability of some areas. In particular, increased water prices resulting from a tiered pricing structure under some subregions and water-year scenarios, when combined with reduced south-of-Delta water supply reliability resulting from a combination of CVP operational constraints on deliveries to the San Luis Unit, could result in difficult choices regarding the affordability of agricultural production as an enterprise. However, to adequately place the effect of tiered pricing aspects of long-term contract renewals in perspective, one must also consider other factors that may arguably have equal or more bearing on the affordability of agricultural production. In particular, the direction of continued agricultural subsidy and price support programs for selected crops, weather patterns, and market prices for agricultural products affect such decisions. Changes in the cost or availability of production inputs also play a large part in the ability of a producer to remain viable. Land, labor, seed, machinery, fertilizers, and water are all important and interrelated components in determining production decisions and enterprise profitability. (Reclamation 2005c)

The cumulative land use impacts of primary concern in the San Luis Unit and SCVWD are associated with ongoing growth pressures that threaten the long-standing agricultural land use base by converting agricultural lands to M&I and residential use. Any conversions from agricultural to M&I land use within the San Luis Unit and SCVWD would not be caused by the terms of the contract renewal, nor by actions of the contractors including the previous water transfer program for 2005–2014 and the current proposed water transfer by the Exchange Contractors. Instead, such changes would be the result of individual and cumulative land use planning decisions of affected counties, cities, and individual landowners. Those decisions will be guided by state and possibly local laws that already or may further require cities and counties to demonstrate adequate water supplies for land development projects.

[5] Renewal of these contracts is being undertaken in pursuance generally of: the Act of June 17, 1902 (32 Stat. 388), as amended and supplemented, including, but not limited to; the Acts of August 26, 1937 (50 Stat. 844) as amended and supplemented, August 4, 1939 (53 Stat. 1187) as amended and supplemented, July 2, 1956 (70 Stat. 483); June 3, 1960 (74 Stat. 156); June 21, 1963 (77 Stat. 68); October 12, 1982 (96 Stat. 1262); October 27, 1986 (100 Stat. 3050); and Title XXXIV of the CVPIA of October 30, 1992 (106 Stat. 4706). Paragraph is from *San Luis Unit Draft Environmental Impact Statement Long-Term Contract Renewal* (Reclamation 2005c).

Two bills enacted in 2001 by the California Legislature, State Bill (SB) 221 (Kuehl) and SB 610 (Costa), require local governments to prepare water supply assessments that look very closely at long-term water supply reliability when approving land development projects consisting of more than 500 housing units (or their equivalent in demands for commercial and industrial projects). For small jurisdictions, projects representing a 10 percent increase in demand trigger the need for water supply assessments. SB 221 defines "sufficient" water supply as the "total water supplies available during normal, single-dry, and multiple-dry years within a 20-year projection that would meet the projected demand. (Reclamation 2005c)

The law does not speak, however, to levels of service, allowing local jurisdictions to define sufficiency in terms of how often and severe water shortages caused by droughts and other events can be. Therefore, one jurisdiction might conclude from its own perspective that a sufficient supply exists, while another, under exactly the same hydrologic conditions, might conclude otherwise. (Reclamation 2005c)

The ultimate decision on water supply sufficiency in the context of land development approval rests with the land use jurisdiction and not the water supply entity, unless they are the same entity. Therefore, unless a local agency has imposed growth restrictions due to a water supply constraint and has specified a standard of reliability and unless a new supply can be assessed against that standard, determining a specific growth-inducing impact due to the added supply is difficult and highly speculative without knowledge of the facts surrounding specific development situations. (Reclamation 2005c)

The effects of long-term contract renewals and both approved and proposed water transfer programs by the Exchange Contractors, when added to the aggregate effects of other past, present, and reasonably foreseeable future actions, will not cause or contribute to impacts to recreational opportunities or resources in the San Luis Unit and SCVWD. Long-term contract renewals call for the same estimated quantities of available future water to be delivered to the same reservoirs and recreational areas with no additional facility modifications or construction. Water storage and conveyance facilities that provide recreational opportunities would not be incrementally affected by the proposed water transfer when combined with long-term contract renewals. Reductions in any reservoir water surface elevations will be attributable to other operational decisions that will each need to consider several timing, quantity, and related constraints, independent of the renewal of long-term water service and repayment contracts and the proposed transfer.

4.6 Socioeconomics

This section describes the expected socioeconomic effects of the No Action, Proposed Action, and Alternative Actions within the Exchange Contractors service area and regional economy. The primary focus of this analysis is the effect on agriculture in the project area and the regional economy and resulting changes in population and employment. The evaluation starts with an analysis of the impacts of the No Action Alternative, then of those for the Proposed Action and Alternative Actions. The section is based on the detailed socioeconomics technical report included as Appendix E.

The analysis consists of two distinct parts. The first examines social and demographic variables, such as population, ethnicity and employment, and related environmental justice concerns. The second examines regional economic variables such as production, employment, and income variables in the project area and regional economy. The key economic measures examined include farm income; regional output, employment and income; and revenues and costs of the Exchange Contractors.

For this analysis, data utilized were at the county and individual district level within the Exchange Contractors service area. The primary "functional economic area" of influence for the Alternatives is the four-county area within which the four individual Exchange Contractor districts are located, i.e., Stanislaus, Merced, Madera, and Fresno. This area includes not only the point of initial (or direct) impact of the alternatives, but also the area within which regional impacts are likely based on supporting industries and expenditure and commuting patterns.

The economy of the four-county area depends importantly on agriculture. Farming employment alone accounts for 12.5 percent of total employment in Merced County, 11.9 percent in Madera County, 6.6 percent in Fresno County, and 5.8 percent in Stanislaus County. Because of the close linkages between production agriculture and the many industries that both sell to and purchase from farmers, the agricultural sector is more important than these data suggest. For the Central Valley overall, agricultural production and agricultural processing account for 21 percent of total income and 25 percent of employment (University of California 2000). For the San Joaquin Valley, the proportions are higher. And, because of the concentration of agriculture within the Exchange Contractors service area, agriculture accounts, directly and indirectly, for at least 50 percent of production and employment.

Estimation of the economic impacts of the No Action, Proposed Action, and two Alternative Actions rests first on the likely effects of the alternatives on production, consumption, and investment decisions in agriculture and related industries. Direct, indirect, induced, and total economic impacts are estimated for each of the alternatives. For each, agriculturally-related direct impacts are presented first, followed by indirect, induced, and total regional economic impacts. The latter are based on estimated from an input-output (I-O) model of the four-county regional economy. Details are included in Appendix E.

The analysis includes an assessment of changes in several economic parameters. No convenient measures are available to assess the significance of the estimated changes in economic variables. It was therefore decided, using professional judgment, that any change of five percent or greater in the impact variables would constitute a significant impact. All monetary values are presented in constant 2004 dollars.

4.6.1 No Action

For the No Action Alternative, the environmental consequences are based on expected physical changes and related economic implications attributed to agricultural production at the end of the 25-year study period relative to existing conditions. The No Action Alternative reflects a scenario of predictable future changes that may occur, based on other approved plans and projects, and which excludes any action alternatives being considered herein. For

each Action Alternative, the environmental consequences are based on future conditions under the alternative relative to No Action Alternative.

The No Action Alternative assumes reasonably-foreseeable events and behavior regarding drainage water and other variables including, among others, continued agricultural market forces, which may be expected to affect irrigation demands; continued effects of hydrology and weather on agriculture; and that farmers as price takers make operating decisions that they expect will provide the greatest possible profit for their enterprises.

The 28,000-acre area within FCWD and the Camp 13 area of CCID are affected by shallow groundwater levels that extend to the crop root zone. Currently, water captured in the area by drainage systems is diverted through Grassland Bypass to the San Luis Drain and ultimately to Mud Slough. However, after December 31, 2009, the Grassland Bypass and San Luis Drain will no longer be available for disposal of drainwater from the 28,000 acres and other areas. All drainwater will then need to be recycled and reused in the area. Consequently, the quality of shallow groundwater will deteriorate and severely affect the yields of the crops planted in the area. Land will go out of production quickly once drainage through the Grassland Bypass is no longer possible.

For the No Action Alternative of the Grassland Bypass Project (Reclamation and San Luis & Delta-Mendota Water Authority 2001), it was assumed, similar to this study, that all agricultural drainwater would be recirculated onto cropland for reuse after 2009. Soil salinity increased rapidly over a 10-year period, and all crop yields, other than cotton, fell. More severe impacts can be expected in the 28,000 acre study area. Drainwater in the area is not only from irrigation of that area, but also from upslope lands. Thus, under the No Action Alternative, the land can be expected to be permanently fallowed even more quickly than that in the GDA. Given the cropping mix in the 28,000-acre area, salt levels will increase in crop root zones and crop yields will decline. At some point, farming will no longer be profitable, and farmers will idle their land. Given the expected outcome for the GDA over 10 years, it is assumed that all of the 28,000 acres will be retired in the 25 year project timeframe. Because land is likely to be permanently idled much sooner, the 25-year timeframe is a very conservative assumption.

The direct economic effects of retiring 28,000 acres from production are the elimination of all direct economic activity generated by agriculture in the affected area. In addition, there would be no project-related expenditures made on conservation projects, payments to farmers, or changes in water treatment costs. As a result, no indirect economic benefits would accrue to the region. Thus, the No Action Alternative would result in no direct or indirect economic activity in the four-county study area that is attributed to agriculture in the affected 28,000-acre area. Relative to existing conditions, the direct annual losses would include $55.6 million in agricultural output and $11.4 million in labor income along with 503 jobs. In total, considering indirect and induced effects, economic losses to the region are estimated to be $89.6 million in annual output, $25.8 million in annual income, and 1,043 jobs.

The Preferred Alternative in the San Luis Unit DEIS involves a tiered pricing program that is based on the full current contract amount of water. Socioeconomic conditions in the San Luis Unit resulting from this alternative are assumed to be similar to existing conditions and the

No Action Alternative because the amount of water delivered, the timing of those deliveries, and the rates and method of payment for water delivered under the Preferred Alternative would not substantially differ from the No Action Alternative. Therefore, there would be no impacts to socioeconomic resources from implementation of the Preferred Alternative. (Reclamation 2005c)

4.6.2 Proposed Action

For this alternative, 20,000 AF of water (including 15,000 AF of pumped groundwater) would replace an equal amount of Exchange Contractors water annually that would then be sold to other CVP contractors in the San Luis Unit and/or San Felipe Division. The remaining 5,000 AF of water would be developed from water conservation and/or land fallowing; for this analysis, it is assumed that land fallowing would be implemented on a voluntary basis (to demonstrate worst-case economic effects). Some of the key direct impacts are summarized below.

4.6.2.1 Water Development Area

Continued Agricultural Production

Assuming 5,000 AF of water from fallowing and water use of 2.75 AF per acre, a total of 1,818 acres would be fallowed on an annual basis. It would be possible to maintain agricultural production on the remaining 26,182 acres by pumping groundwater. Assuming no change in crop yields, patterns, and prices (in real terms) relative to existing conditions, direct agricultural output production would be approximately $52.0 million annually.

Payments to Farmers

It is assumed that farmers would fallow their land voluntarily and that they would be paid a sum that is equivalent to the average net profit they receive per acre for the crops grown on the land; this value is estimated at about $220 per acre per year (2004 dollars). Based on fallowing of 1,818 acres, total payments to farmers are estimated to be about $400,200 annually over the life of the project. Net profit values were taken from crop production budgets published by the University of California Cooperative Extension (2003a, 2003b, and 2004). Crop yields are assumed to be the same as those reported by the Fresno County Agricultural Commissioner. Farmer use of the proceeds is assumed to be split equally between outlays for farm machinery and equipment and household consumption.

Reduced Drainage Output from Tile Drains

Pumping 15,000 AF of groundwater per year is estimated to reduce drain flows by 101 AFY on average.[6] Management of such flows using tile systems costs an average of $1,200 per AF.[7] The reduction of drainage flows would thus enable farmers to avoid $121,500 annually in treatment costs. This represents a redistribution of money, a reduction of money entering

[6] Ken Schmidt, May 2007. "Groundwater Conditions in the Firebaugh Canal Water District and CCID Camp 13 Drainage District," Appendix A; personal communication June 22, 2007.

[7] Steve Chedester, San Joaquin River Exchange Contractors Water Authority, December 19, 2005; personal communication.

the water treatment sector of the regional economy and an increase in farmer income. It is reasonable to assume that at least part of those funds would be reinvested in the farming enterprise. While the proportions are unknown, it is assumed that the increase is divided equally between outlays for farm machinery and equipment and for household consumption.[8]

Receipt of Funds from Purchasers of Exchange Contractors Water

It is assumed that the lump-sum payment by purchasers of Exchange Contractors water corresponds to the capital costs of improvement and projects in the FCWD and Camp 13 area as provided by the Exchange Contractors, approximately $28.9 million. Assuming a 25-year program and a 3.5 percent interest rate, the equivalent uniform annual payment the Exchange Contractors would receive for the water is about $1.8 million, or approximately $88 per AF (not adjusted for inflation).

Expenditure of Funds Received by Exchange Contractors

The Exchange Contractors would use the revenues from water sales to pay farmers for fallowing land, for new wells and pumps to extract groundwater, canal lining, irrigation system improvements, facilities to treat drain water, and for a portion of the management and treatment identified in the Westside Regional Drainage Plan. For this analysis, it is assumed that the entire adjusted annualized capital cost of the project (or nearly $1.8 million) would be spent on an annual basis. Annualized values of capital expenditures and annual operations and maintenance (O&M) costs are estimated to be $1.4 million and $1.6 million, respectively. The remaining approximate $0.4 million would be in annual payments to farmers for fallowing land. In addition, it has been estimated that the cost to pump groundwater from the 28,000-acre area will average $30 per AF. The economic impacts from these outlays would be in the form of additional purchases of diesel fuel for the pumps and O&M expense for the equipment.

Reduced Flows of Poor Quality Groundwater to Madera County

From Dr. Schmidt's report (see Appendix A), it was noted that poor quality groundwater has migrated from the area to the northeast, including parts of Madera County.[9] While the Proposed Action would reduce that flow, Dr. Schmidt notes that it alone would be insufficient to fully address the poor quality groundwater in southwestern Madera County. Thus, this analysis does not include the impacts of the Proposed Action on the flows to Madera County.

Regional Economic Effects

The annual direct economic effects attributed to crop production, accounting for land fallowing, include $52.0 million in agricultural output, $10.7 million in direct income, and 470 direct jobs. Total economic impacts include annual measures of $83.8 million in output and $24.1 million in income, as well as 975 jobs. These represent a decline in economic

[8] The drainage number is subject to change based on further investigation. If the number does change, then the distribution of funds between farmer income and conservation capital expenditures will also change, as will impacts. However, the level of significance will not change.

[9] Ken Schmidt, May 2007, "Groundwater Conditions in the Firebaugh Canal Water District and CCID Camp 13 Drainage District," Appendix A.

benefits relative to existing conditions because of land fallowing, but are greater than the complete loss of benefits that would result under the No Action Alternative.

The conservation projects attributable to the Proposed Action would generate economic benefits. Assuming that these improvements would occur uniformly over the 25-year project timeframe, the new demand for water conservation services and infrastructure and related O&M would generate approximately $2.9 million in direct output, $1.3 million in direct income, and about 23 jobs on an annual basis in the four-county study area. These direct effects would generate additional indirect benefits that when totaled equal $4.5 million in total output, $1.9 in total income, and 40 jobs. These represent new economic benefits relative to existing conditions and future No Action conditions.

The payment to farmers for land fallowing program would also generate economic benefits as a result of increased farmer income. Under the Proposed Action, the approximately $400,200 paid to farmers annually would generate final demand for goods and services resulting in direct effects of $0.3 million in annual output, $0.1 million in income, and roughly 3 jobs. In total, the annual output, income, and employment effects are estimated to be $0.4 million, $0.1 million, and about 4 jobs, respectively. These values represent a positive change from existing and future No Action conditions where no farm payments are made.

The Proposed Action would reduce the costs for drainwater management by about $121,500 per year. Therefore, these funds would not flow to businesses in the local water treatment sector, a negative effect. However, the cost savings represent additional income to local farmers, who are expected to use the savings for both farm equipment and household expenditures. Overall, the net direct effects of these avoided costs include a loss of approximately $42,100 in annual output, $28,600 in income, and less than one job. In total, the annual regional reductions in output, income, and employment are estimated to be $65,500, $38,400 and less than one job, respectively. These values represent a decrease in economic activity relative to existing conditions.

The aggregated direct economic benefits of the Proposed Action are $55.1 million in annual output, $12.0 million in annual income, and 495 jobs. Total regional economic benefits generated in the four-county study area are $88.7 million in output, $26.2 million in income, and about 1,019 total jobs on an annual basis over 25 years.

4.6.2.2 Water Receiving Areas

The effects of the additional water from the proposed transfer program on the San Luis Unit and SCVWD contractors would be beneficial in that they would assist in meeting water demands of existing uses and improved water supply reliability. For any deliveries beyond recent CVP allocations and contract amounts, appropriate NEPA/CEQA and ESA/CESA compliance would be required by Reclamation prior to completion of any transfer agreements such that there would be no adverse effects and any land use changes would be consistent with local land use policies.

4.6.2.3 CEQA Checklist for Socioeconomics

XII. POPULATION AND HOUSING	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less than Significant Impact	No Impact
Would the project:				
a) Induce substantial population growth in an area, either directly (for example, by proposing new homes and businesses) or indirectly (for example, through extension of roads or other infrastructure)?				✓
b) Displace substantial numbers of existing housing, necessitating the construction of replacement housing elsewhere?				✓
c) Displace substantial numbers of people, necessitating the construction of replacement housing elsewhere?				✓

Discussion:

a) The Proposed Action would have less-than-significant impacts on population and housing growth in the four-county region, either directly or indirectly. Relative to No Action conditions, regional economic effects would be beneficial because some agricultural production would continue. However, total economic activity under the Proposed Action would be lower than existing conditions. Specifically, the total output, income, and employment declines represent 0.03 percent of current regional output and income levels and 0.07 percent of regional employment levels. Because employment levels are expected to decline under the Proposed Action, population levels are also expected to decrease if alternative jobs are not available or remain constant if workers find employment elsewhere in the region. No adverse population effects would occur relative to existing conditions.

   The proposed-water transfers to San Luis Unit and SCVWD would assist in meeting water demands of existing agricultural and M&I water users and in improved water supply reliability. For any deliveries beyond CVP contract amounts, appropriate NEPA/CEQA and ESA/CESA compliance would be required by Reclamation prior to completion of any transfer agreements such that there would be no adverse effects and any land use changes would be consistent with local land use policies.

b) The Proposed Action would not displace substantial numbers of existing housing units, necessitating the construction of replacement housing elsewhere. In fact, housing demands are expected to decline corresponding to population reductions if alternative employment opportunities are not present in the region. There would be no effect on the existing housing stock in the region.

c) The Proposed Action would not displace substantial numbers of people, necessitating the construction of replacement housing elsewhere. See the discussion for housing units under Item b.

4.6.3 Alternative Action – Groundwater Pumping Only

4.6.3.1 Water Development Areas

Continued Agricultural Production

The Alternative Action would make 15,000 AF of water available for transfer annually, rather than the 20,000 AF under the Proposed Action. All water would be provided by groundwater pumping, none by fallowing or conservation measures. With pumped groundwater and no land fallowing, agricultural production would be unchanged from existing conditions; i.e. $55.6 million in output annually.

Reduced Drainage Output from Tile Drains

Based on an equivalent amount of groundwater pumping (i.e., 15,000 AFY), this alternative would result in the same decline in tile drain output as under the Proposed Alternative.

Receipt of Funds from Purchasers of Exchange Contractors Water

This alternative would lead to the same receipt of funds by the Exchange Contractors as under the Proposed Alternative.

Expenditure of Funds Received by Exchange Contractors

The Exchange Contractors would use the funds received from water purchasers for the installation of new groundwater wells and pumps, water conservation measures, and water treatment. Expenditures for those goods and services would be slightly higher than under the Proposed Action because no part of the funds would be required to compensate farmers for fallowing land. The total annualized capital costs of this alternative would be nearly $1.8 million, while annual O&M expenditures would be $1.6 million.

Regional Economic Effects

Agricultural production and related economic effects would be unchanged relative to existing conditions. Under this alternative, the annual direct economic effects attributed to crop production include $55.6 million in agricultural output, $11.4 in income, and 503 jobs. The attendant total annual regional economic benefits include $89.6 million in output, $25.8 million in income, and 1,043 jobs. In addition, the implementation of conservation projects would directly generate about $3.3 million in economic output and $1.5 million in income annually while supporting 26 jobs. Total economic benefits attributed to conservation projects would include $5.1 million in output and $2.2 million in income annually, as well as 45 jobs.

This alternative also helps avoid outlays for water treatment, similar to the Proposed Alternative. The net direct effects include a loss of $42,100 in annual output, $28,600 in

income, and less than one job. Total annual reductions in output, income, and employment are estimated to be $65,500, $38,400, and less than one job, respectively.

The total direct regional economic benefits of this alternative include $58.8 million in annual output, $12.9 million in annual income, and 528 jobs. Total economic benefits are $94.7 million in annual output, $28.0 million in annual income, and 1,088 jobs over the 25-year project timeframe.

4.6.4 Alternative Action without Groundwater Pumping

Under this Alternative Action, no groundwater would be pumped. Instead, up to 20,000 AFY would be developed, including up to 15,000 AFY from cropland fallowing and up to 15,000 AFY from conservation activities. It is assumed for this analysis that 15,000 AFY are developed from land fallowing and 5,000 AFY from conservation measures.

4.6.4.1 Continued Agricultural Production

Assuming an average irrigation water requirement of 2.75 AF per acre, approximately 5,455 acres of farmland would be fallowed under this alternative. The land fallowed would be rotated among the 28,000 acres such that the same land would not be fallowed consecutively for more than one year. The remaining 22,545 acres would remain in production. For the analysis, it is assumed the future cropping patterns and crop prices would be comparable to existing conditions. It is also assumed crop yields would not change. The total reduced crop output from fallowing is input into the I-O model as a reduction in final demand for the crops fallowed, which is assumed to distribute evenly across all crop groups produced in the area.

The analysis in Appendix E was based on 5,455 acres of temporary land fallowing. Representative values for the leading three crops produced in the area include production losses of $4.4 million for cotton, $1.3 million for alfalfa, and $3.5 million for melons, a total annual value of $9.2 million. Total foregone profit for those crops on 5,455 acres is estimated to total about $1.2 million per year (see Appendix E).

4.6.4.2 Payments to Farmers

Similar to the Proposed Action, farmers are assumed to fallow their land voluntarily and to be paid the equivalent of the average net profit they receive for the crops grown on the land, estimated at $220 per acre. Under this alternative, total payments to farmers are estimated to be $1.2 million annually for the fallowing of 5,455 acres, which would be allocated to farm investment and household expenditures.

4.6.4.3 Funds Received from Purchasers of Exchange Contractors Water

The Exchange Contractors are expected to receive the same lump-sum payment as that shown for the Proposed Action, roughly $28.9 million.

4.6.4.4 Expenditure of Funds Received by Exchange Contractors

The expenditure of funds received for transferred water transfer would be different than under the Proposed Action. No new groundwater wells would be installed, since there would be no groundwater pumping under this alternative. Instead, funds would be used to pay

farmers for fallowing their land and for additional irrigation improvements, canal lining, and related O&M costs. The annualized capital costs by the Exchange Contractors over the 25-year project are estimated to be about $551,000. Annual O&M expenditures are estimated to be $800,000, and total annual costs are estimated to be $1.4 million.

4.6.4.5 Regional Economic Effects

The direct annual economic effects attributed to crop production on the 22,545 acres of land remaining in production in this alternative would include $44.8 million in agricultural output, $9.2 million in direct income, and 405 direct jobs. Total regional economic effects would include $72.2 million in annual output, $20.8 million in annual income, and 840 jobs. These represent a slight decrease from the Proposed Action because of fallowing 5,455 acres rather than 1,818 acres. However, these values represent economic benefits that would otherwise be lost under the No Action Alternative.

The conservation projects and related O&M that would be implemented under the Alternative Action would also generate approximately $1.3 million in annual direct output, $0.6 million in annual direct income, and 10 direct jobs in the four-county study area (assuming that these improvements would occur uniformly over the 25-year project timeframe). Total direct and indirect economic effects attributed to conservation projects would be $2.0 million in total annual output, $0.9 in total annual income, and 18 jobs. These are new benefits relative to existing and future No Action conditions.

The approximate $1.2 million annual payments to farmers for fallowing land would also generate economic benefits. The funds are assumed to be split equally between farm equipment investment and household expenditures. Overall, the direct effects of the final demand generated by these payments include $0.8 million in annual output, $0.3 million in income, and about seven jobs. In total, the annual output, income, and employment effects of fallowing payments are estimated to be $1.2 million, $0.4 million, and 12 jobs, respectively. These values represent a positive change from existing and future No Action conditions.

The aggregate direct economic benefits of the Alternative Action are $46.9 million in annual output, $10.1 in annual income and 422 jobs. Total regional impacts in the four-county study area include $75.4 million in annual output, $22.1 million in annual income, and 870 jobs over the 25-year project timeframe.

4.6.5 Summary of Regional Economic Impacts among Alternatives

Under No Action, all 28,000 acres of cropland would go out of production within the 25-year project timeframe, leading to losses equal to the total regional economic benefits realized under existing conditions: $89.6 million in annual production, $25.8 million in annual income, and 1,043 jobs. No water would be sold by the Exchange Contractors other than under the programs currently in place. There would no change in construction of conservation projects, no payments to farmers for fallowing land, and no avoided costs for treating drain water relative to current programs. Consequently, the impacts for these latter three categories under the No Action Alternative are zero. Overall, the net regional impacts associated with the No Action Alternative include losses equivalent to economic benefits generated under existing conditions.

Under the Proposed Action, crop production would decline from existing conditions because of fallowing 1,818 acres. Consequently, the regional crop production impacts would be lower: $5.8 million in total economic output, $1.7 million in total labor income, and 68 annual jobs compared with existing conditions. However, the total direct expenditures for wells, pumps, and related infrastructure and conservation projects would be $28.9 million, or $1.4 million per year. Annual operations and maintenance costs would be $1.6 million. The total regional impacts associated with these outlays would be $4.5 million in output, $1.9 million in personal income, and 40 new jobs. The avoided costs to farmers of treating 101 AF of drain water per year are $121,500. The net direct and total regional economic effects from the avoidance of drainage costs are negligible. Overall, under the Proposed Alternative, total regional output decreases $0.9 million annually relative to existing conditions, while total income decreases $0.4 million annually, and employment increases by 24 jobs.

For the Alternative Action with substitute water from groundwater pumping only, all agricultural land would remain in production. The regional economic effects of agricultural production would not change from existing conditions. The annualized capital costs of wells, pumps, and related infrastructure for groundwater pumping and other goods and services for conservation projects would be $1.8 million. Annual O&M costs would be $1.6 million. The associated total regional output, income, and employment impacts would be, respectively, $5.1 million, $2.2 million, and 45 new jobs.

For the Alternative Action without Groundwater Pumping, 5,455 acres of cropland would be fallowed. Relative to existing conditions, total crop production would decline by more than $17.4 million per year, while income would fall $5.0 million annually, and employment would decline by 203 jobs. Because of conservation programs and payments to farmers, the adverse output, income, and employment declines from fallowing would be partially offset. However, the net regional impacts of fallowing, conservation programs, and payments to farmers include annual losses of $14.2 million in output, $3.7 million in income, and 173 jobs, all compared to existing conditions. Relative to overall economic measures for the four counties, the impacts would be would be relatively small. However, impacts within smaller communities, particularly those on the west side of the San Joaquin Valley, may be important, especially if land retirement under No Action occurs at this local level.

4.6.6 Cumulative Impacts

By themselves, the impacts estimated for the Action Alternatives are not significant for the four-county study area. The total amount of cropland harvested in the four counties in which the Exchange Contractors service area is located has changed little since 1990, but has varied by as much as 35,000 acres per year. Thus, idling of up to 5,455 acres under the Alternative Action without Groundwater Pumping would be within the normal range of variation and would not be significant, all other factors unchanged.

The permanent retirement of the entire 28,000-acre area under the No Action Alternative would be less than significant relative to cropland acreage for the four counties. However, it would be almost 12 percent of total cropland in the Exchange Contractors service area, a significant impact. Moreover, several areas within the San Joaquin Valley could be idled

permanently because of water supply shortages and subsurface drainage problems. As noted by Reclamation (September 2005c), more than 109,000 acres would be retired within the San Luis Unit under both the No Action and Preferred Alternatives described for the long-term contract renewal for that Unit.

If all retired San Luis Unit land and idled land under the No Action Alternative are in Fresno County, cumulatively about nine percent of the total cropland acreage in that county would be taken out of production, a significant impact. However, the fallowing of San Luis Unit land alone constitutes a significant impact using the five percent criterion. For this study under the Alternative Action, the impacts of fallowing in the Exchange Contractors area would be offset by the payments for water sold and investment in groundwater extraction, conservation, and irrigation system improvements. At a regional level with extensive land retirement, similar reinvestments from water sold and increased production in other areas would avoid a cumulatively considerable effect.

Other potential cumulative impacts are not quantified. For example, the provisions of CALFED are not yet fully implemented and the effects on Delta exports are not fully known. Some of the other laws or policies that may affect parties that would be affected by the alternatives in this study include Total Maximum Daily Load limits on agricultural discharges and restrictions on on-farm stationary engines. In addition, the potential impacts of the Environmental Water Account are not included among cumulative impacts. The conditions underlying such purchases are unpredictable, other than CALFED's annual goal of purchasing at least 190,000 AF, and such transfers may be "repaid" with additional water releases at other times. Consequently, the impacts are unknown.

4.7 Environmental Justice

Executive Order 12898 requires each Federal agency to achieve environmental justice as part of its mission by identifying and addressing disproportionately high and adverse human health or environmental effects, including social or economic effects, of programs, policies, and activities on minority populations and low-income populations of the United States. USEPA's Office of Environmental Justice (U.S. Department of Energy, Office of Environmental Policy and Assistance, 1997) offers the following definition:

"The fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies. Fair treatment means that no group of people, including racial, ethnic, or socioeconomic group should bear a disproportionate share of the negative environmental consequences resulting from industrial, municipal, and commercial operations or the execution of Federal, State, local, and tribal programs and policies."

This section provides baseline demographic information used in an analysis of environmental justice impacts. The analysis focuses on the Exchange Contractors service area where crop idling/temporary land fallowing could occur to develop the transfer water because this is the area of potential effect.

While consideration of environmental justice is a Federal requirement based on Executive Order 12898; CEQA has no corresponding requirement. Under CEQA, economic and social changes resulting from a project are not treated as a significant effect unless related to a physical change in the environment. The socioeconomic effects identified in Section 4.6 affect the social concern of environmental justice, but environmental justice effects do not result directly from or produce physical changes in the environment.

4.7.1 Impact and Evaluation Criteria

To address environmental justice concerns, the following issues are evaluated to determine potential impacts and their level of significance:

- Are affected resources used by a minority or low-income community?
- Are minority or low-income communities disproportionately subject to environmental or human health or economic impacts?
- Do the resources used for the project support subsistence living?

The four-county area contains high percentages of Hispanics and persons/families living below the poverty level. Unemployment is significantly higher in the four-county area and vicinity than in other regions of the State. The importance of agriculture to the local economy was described in Section 4.6. Consequently, if agriculture is adversely impacted by the alternatives, the potential exists for low-income and minority groups to be disproportionately affected from an economic standpoint because these groups have disproportionately high levels of employment in the agricultural and food processing industries.

Environmental justice issues are focused on environmental impacts on natural resources (and associated human health impacts) and potential socioeconomic impacts. Impacts to employment would occur from the No Action Alternative because of the effect of lower-quality groundwater on crop yields over time. Thus, the potential exists for a socioeconomic impact on minority or low-income groups. No human health effects are associated with the proposed water transfer program.

Environmental resources used by low-income and Hispanic groups in the four-county area primarily consist of the wildlife refuges. Existing minority and low-income groups in the four-county area use the wildlife refuges for hunting and wildlife viewing. This use is expected to continue over the 2005–2030 period. However, this use is recreational in nature and does not provide subsistence-level value. In addition, it is not known whether these groups use these resources disproportionately relative to the overall population. Therefore, no environmental justice effects would occur based on recreation resources for any of the alternatives.

Because no effect would occur relative to environmental, human health or recreation resources, only effects to economic resources are evaluated for the No Action Alternative and the two Action Alternatives.

4.7.2 No Action

Under the No Action Alternative, shallow groundwater conditions in the 28,000-acre area will worsen in 2010, at which point the Grassland Bypass and San Luis Drain will no longer be available for disposal of drain water from the area. All drainwater will then need to be recycled and reused in the area. Land will go out of production quickly, very likely within 10 years after December 31, 2009. At that point, all farm labor tied to the 28,000-acre area will be displaced. As discussed in Section 4.6 and Appendix E, 503 agricultural production jobs would be lost, including both part-time and full-time employees. Relative to direct agricultural employment in the four-county region of nearly 58,000 jobs, this decrease in employment levels would be insignificant. However, relative to direct agricultural employment in the Exchange Contractors service area (approximately 3,200 jobs), these impacts would be significant.

Renewal of the long-term water service contracts between the U.S. Bureau of Reclamation (Reclamation) and the water contractors within the San Luis Unit and SCVWD would not involve the construction of new facilities, result in any known health hazards, cause the generation of any hazardous wastes, or result in any property takings. Moreover, renewal of these contracts would not directly or indirectly cause disproportionately high and direct or indirect adverse human health or environmental effects. In examining impacts to the San Luis Unit as a whole, Reclamation determined that renewal of the long-term water service contracts would not disproportionately affect the human health or physical environment of minority or low-income populations (Reclamation 2005c). In examining impacts to the study area as a whole, the renewal of the long-term water service contracts would not disproportionately affect minority or low-income populations.

4.7.3 Proposed Action

Under the Proposed Action, 15,000 AFY of substitute water would be provided by groundwater pumping and 5,000 AFY by land fallowing. Approximately 1,818 acres of farmland would be fallowed, and crop production would continue on the remaining 26,182 acres in the project area, with no assumed changes in crop yields, patterns, and prices relative to existing conditions. Consequently, agricultural employment impacts relative to No Action conditions would be beneficial. However, relative to existing conditions, economic output, income, and employment attributed to agricultural production would decline slightly due to land fallowing.

4.7.4 Alternative Action – Groundwater Pumping Only

This alternative would involve the annual substitution of up to 15,000 AFY of groundwater similar to the Proposed Action; however, no land fallowing would occur. With groundwater pumping only and no land fallowing, agricultural production would be unchanged from existing conditions. Therefore, there would be no effect on agricultural employment relative to existing conditions and beneficial effects compared to the No Action alternative. Other impacts would be similar to those for the Proposed Action. No adverse impacts to environmental justice are anticipated.

4.7.5 Alternative Action without Groundwater Pumping

Under this Alternative Action, the analysis assumes 15,000 AFY would be provided by fallowing 5,455 acres of farmland and 5,000 AFY would be provided by conservation activities. Crop production would continue on the 22,545 acres of farmland not fallowed. This alternative would result in the greatest declines in agricultural employment due to land fallowing. Direct employment effects attributed to reduced agricultural production relative to existing conditions would be a decrease of 98 jobs, which would be insignificant at the four-county and Exchange Contractors service area levels. Decreases in direct agricultural employment would be favorable relative to No Action conditions, where job losses would be more severe.

4.7.6 Impact and Mitigation Summary

For each of the alternatives, the following sections summarize potential effects to environmental justice:

- **No Action.** Potential significant adverse effect on the Hispanic community due to entire 28,000 acres of cropland going out of production after December 31, 2009 and resultant declines in agricultural employment. There appears to be adequate alternative agricultural jobs available in the four-county area, perhaps not in the Exchange Contractors service area.
- **Proposed Action.** Some impact to the Hispanic community from fallowing of 1,818 acres in the 28,000 acre study area. However, as noted for No Action, there appear to be adequate alternative agricultural jobs available in the four-county area, though perhaps not in the Exchange Contractors service area.
- **Alternative Action – Groundwater Pumping Only.** No impact relative to existing conditions, favorable impact relative to No Action because the entire 28,000-acre area would remain in production. No adverse impact on Hispanic community.
- **Alternative Action without Groundwater Pumping.** Some impact to the Hispanic community from fallowing of 5,455 acres annually in the 28,000 acre study area. However, as noted for No Action, there appear to be adequate alternative agricultural jobs available in the four-county area, though perhaps not the Exchange Contractors service area.

4.7.7 Cumulative Effects

The Action Alternatives do not contribute incremental environmental justice effects. Land fallowing of the entire 28,000-acre area under No Action could be cumulatively considerable in the San Joaquin Valley, but adequate alternative agricultural jobs would mean the effect on environmental justice would not be cumulatively considerable.

4.8 Other Resources and Concerns

The CEQA checklist is completed below for other environmental resources and concerns: aesthetics, energy and mineral resources, geology and soils, hazards and hazardous materials, noise, public services, transportation and traffic, and utilities and service systems.

I. AESTHETICS	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less than Significant Impact	No Impact
Would the project:				
a) Have substantially adverse effect on a scenic vista?				✓
b) Substantially damage scenic resources, including, but not limited to, trees, rock outcroppings, and historic buildings within a State scenic highway?				✓
c) Substantially degrade the existing visual character or quality of the site and its surroundings?				✓
d) Create a new source of substantial light or glare that would adversely affect day or nighttime views in the area?				✓

Discussion:

a) Water Development Area. The Proposed Action and Alternative Actions would maintain visual conditions very similar to the existing condition. Construction or operation of the wells is not expected to adversely affect the visual character of the adjacent agricultural area, because the wells would be distributed throughout the well field and would not be visible from major roadways or the town of Mendota. Therefore, the Proposed Action and Alternative Actions would not have an adverse effect on a scenic vista.

Water Receiving Areas. The proposed transfers would not result in adverse impacts to visual resources in the San Luis Unit when compared to the No Action Alternative or existing conditions. As with the No Action Alternative, the visual character of lands irrigated in the past for agricultural purposes would not substantially change. Because of the combined use of surface and groundwater, the general cultivated and fallowed acreage patterns would be similar to historical patterns, and agricultural viewsheds would not be significantly altered. Neither scenic views nor visibility would be adversely impacted.

b) See Item a. The Action Alternatives would not be visible from scenic highways or interfere with views of any historical structures.

c) See Item a. The Action Alternatives would not degrade the existing visual character of the agricultural site and its surroundings.

d) The transfer of water or development of water would not result in the creation of a new source of light or glare. No lighting is proposed for any Action Alternative.

X. ENERGY AND MINERAL RESOURCES	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less than Significant Impact	No Impact
Would the project:				
a) Result in the loss of availability of a known mineral resource that would be of value to the region and the residents of the State?				✓
b) Result in the loss of availability of a locally-important mineral resource recovery site delineated on a local general plan, specific plan or other land use plan?				✓
c) Conflict with adopted energy conservation plans?				✓
d) Result in the need for new or substantially altered power or natural gas utility systems?				✓
e) Create any significant effects on local or regional energy supplies and on requirements for additional energy?				✓
f) Create any significant effects on peak and base period demands for electricity and other forms of energy?				✓
g) Comply with existing energy standards?				✓

Discussion:

a) The project area is not located near any known mineral resources or principal mineral producing locations. Sand and gravel producing areas are located within CCID lands, but not in the project area. Therefore, no impacts would result from implementation of any of the Action Alternatives.

b) The proposed groundwater pumping/water transfer project would not result in the loss of availability of a locally-important mineral resource recovery site delineated on the Fresno County Plan. See item a.

c) The project would not conflict with adopted energy conservation plans.

d) The project would not result in the need for new or substantially altered power or natural gas utility systems.

e) Water Development Area. The project would not create any significant effects on local or regional energy supplies and on requirements for additional energy. During well

installation both electric and petroleum resources would be needed for construction activities and petroleum products would be required during operation of the project. There would be no impact resulting from the use of non-renewable resources during the construction/operation of the Proposed Action. The only non-renewable resource that would be used is diesel fuel by construction vehicles and the use of diesel engines for permanent operations. Each pump would use approximately 180 gallons per day and approximately 21,600 gallons per year of diesel fuel, based on expected operation of 120 days within the year. Electricity and diesel usage would increase during construction and operation. Long-term operations would use only minor amounts of fuel for maintenance vehicles and occasional generator operation.

Water Receiving Areas. There would be no substantial impacts to power resources from implementation of the alternatives with groundwater pumping. With respect to energy demand, total energy requirements are not expected to substantially differ from existing conditions as pump loads would remain relatively similar to those currently observed within the San Luis Unit. Any increase in energy demand from the new wells or use of the additional water would be minimal and would be readily met with resources currently owned and operated by several suppliers, including Pacific Gas & Electric Company.

f) No existing energy standards are applicable to the Proposed Action.

VI. GEOLOGY AND SOILS	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less than Significant Impact	No Impact
Would the project:				
a) Expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving:				
▪ Rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map issued by the State Geologist for the area or based on other substantial evidence of a known fault? Refer to Division of Mines and Geology Special Publication 42.				✓
▪ Strong seismic ground shaking?				✓
▪ Seismic-related ground failure, including liquefaction?				✓
▪ Landslides?				✓
b) Result in substantial soil erosion or the loss of topsoil?			✓	

VI. GEOLOGY AND SOILS	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less than Significant Impact	No Impact
c) Be located on a geologic unit or soil that is unstable, or that would become unstable as a result of the project, and potentially result in on- or off-site landslide, lateral spreading, subsidence, liquefaction or collapse?			✓	
d) Be located on expansive soil, as defined in Table 18-1-B of the Uniform Building Code (1994), creating substantial risks to life or property?				✓
e) Have soils incapable of adequately supporting the use of septic tanks or alternative waste water disposal systems where sewers are not available for the disposal of waste water?				✓

Discussion:

a) Water Development Area. Overall, the proposed groundwater pumping/water transfer project would result in a less than significant impact for the following reasons:

- No known fault lies within the water development area. The closest faults are the: Ortigalita Fault (originates near Crow Creek in western Stanislaus County and extends southeast to a few miles north of Panoche in western Fresno County); Nunez Fault (located six to seven miles northwest of Coalinga); and San Andreas Fault (lies to the west and southwest of Fresno County) (County of Fresno 2000). The San Andreas Fault is of primary concern when evaluating seismic hazards throughout western Fresno County (County of Fresno 2000). Construction of the groundwater wells, however, would not rupture a known earthquake fault, as none are located within the project area.
- The water development area lies within Seismic Zone 3, as does most of Fresno County (County of Fresno 2000). A high-magnitude earthquake on one of the faults that lie along the eastern and western boundaries of Fresno County, has the potential to cause moderate intensity ground shaking in Fresno County (County of Fresno 2000).
- In the area of the proposed groundwater wells, deposits consist of Corcoran Clay, Sierran Sands, and Coast Range alluvial deposits. These soils are too coarse or high in clay content to be conducive to liquefaction.
- The water development area is not located in a high landslide hazard area (County of Fresno 2000).

Water Receiving Area. Development of the transfer water and its use in the receiving areas are expected to have no direct or indirect impacts on soils or geology. Therefore,

although historically observed rates of soil salinization and land subsidence are expected to continue, the Action Alternatives do not exacerbate regional conditions and are expected to result in no adverse impacts on soils and geology when compared to existing conditions and the No Action Alternative.

b) For the Proposed Action, the area to be disturbed by construction activity is small (400 square feet per well), so soil erosion is not a significant concern. Although soil erosion is a concern during temporary land fallowing, soil management practices would be taken to minimize soil erosion under the Alternative Action with temporary land fallowing. Land is normally disked for weed control or planted with a cover crop, which is subsequently disked. These soil management practices minimize erosion and loss of topsoil, dust, and the development of noxious weeds. There would be no impact in the water receiving areas. See item a.

c) The water development area is not located on a geologic unit or soil that is unstable. Groundwater pumping below the Corcoran Clay in adjacent areas has resulted in land subsidence. However, the Proposed Action would not pump below the Corcoran Clay and not cause subsidence that would impact the adjacent canals or other structures within the project area. There would be no impact in the water receiving areas. See item a.

d) The water development area is not located on expansive soil (County of Fresno 2000), and therefore would not pose a risk to life or property. There would be no impact in the water receiving areas due to no conversion of land to other uses under a Phase 1 transfer (see Section 2.4, Phase 1). See item a.

e) Septic tanks or alternative waste water disposal systems would not be needed for the proposed groundwater pumping/water transfer project.

VII. HAZARDS AND HAZARDOUS MATERIALS	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less than Significant Impact	No Impact
Would the project:				
a) Create a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials?			✓	
b) Create a significant hazard to the public or the environment through reasonably foreseeable upset and accident conditions involving the release of hazardous materials into the environment?			✓	
c) Emit hazardous emissions or handle hazardous or acutely hazardous materials, substances, or waste within one-quarter mile of an existing or proposed school?				✓

VII. HAZARDS AND HAZARDOUS MATERIALS	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less than Significant Impact	No Impact
d) Be located on a site that is included on a list of hazardous materials sites compiled pursuant to Government Code Section 65962.5 and, as a result, would it create a significant hazard to the public or the environment?				✓
e) For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project result in a safety hazard for people residing or working in the project area?				✓
f) For a project within the vicinity of a private airstrip, would the project result in a safety hazard for people residing or working in the project area?				✓
g) Impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan?				✓
h) Expose people or structures to a significant risk of loss, injury or death involving wildland fires, including where wildlands are adjacent to urbanized areas or where residences are intermixed with wildlands?				✓

Discussion:

a) Under the Proposed Action and Alternative Action – Groundwater Pumping Only, diesel fuel (180 gallons per engine per day for 120 days for 20 wells) and 19 percent aqueous ammonia (6 gallons per engine per day for 120 days for 20 wells) would be supplied to the engines for the groundwater pumps. However, the amount of material transported would not create a significant hazard to the public or environment from its transport over regional roadways to the agricultural area locations. The Alternative Action without Groundwater Pumping would have no impact under this item.

b) There is a small potential for an accidental release of diesel or aqueous ammonia. However, mitigation measures already being implemented for air quality control would minimize this potential.

c) No schools are located or proposed to be located within ¼ mile of the well development area. The community of Firebaugh is located near the well development area and contains three schools.

d) The well development area is not located on a hazardous materials site, and therefore would not impact the public or environment.

e) Two basic utility airports are located near the project area. The Firebaugh Municipal Airport has one runway and handles about 20 aircraft (18,900 operations per year), and the Mendota Municipal Airport has one runway and handles about three aircraft (13,000 operations per year) (County of Fresno 2000). The project would not result in a safety hazard to people at either airport.

f) See item e.

g) The majority of hazardous materials incidents in Fresno County are fuel-spill related (County of Fresno 2000). As any accidental release is expected to be fuel-spill related, the Proposed Action would not interfere or impair Fresno County's adopted emergency response plan or evacuation plan.

h) Wildland areas are not located within the well development area, so there is no risk of wildland fires from operation of the wells. Therefore, the Action Alternatives would not result in an impact to this item.

XI. NOISE	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less than Significant Impact	No Impact
Would the project result in:				
a) Exposure of persons to or generation of noise levels in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies?				✓
b) Exposure of persons to or generation of excessive groundborne vibration or groundborne noise levels?			✓	
c) A substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project?				✓
d) A substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project?			✓	

XI. NOISE	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less than Significant Impact	No Impact
e) For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project expose people residing or working in the project area to excessive noise levels?				✓
f) For a project within the vicinity of a private airstrip, would the project expose people residing or working in the project area to excessive noise levels?				✓

Discussion:

a) The Proposed Action would not result in the exposure of persons to or the generation of noise levels in excess of standards established in the local general plan or noise ordinance, or in the applicable standards of other agencies. The Fresno County Ordinance, Title 8, Health and Safety, Section 8.40.060, Noise Source Exemptions, lists both construction activities (conducted between 6:00 am and 9:00 pm, Monday through Friday, and between 7:00 am and 9:00 pm on Saturday and Sunday) and agricultural activities on agricultural land as being exempt from the noise standards set forth in the ordinance.

b) The Proposed Action would result in the exposure of persons to and generation of excessive groundborne vibration or groundborne noise levels during both construction and operation. However, these persons would be construction workers and maintenance workers, respectively, and the exposure would be temporary and short-term, and therefore not significant.

c) The Proposed Action would not result in a substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project.

d) The Proposed Action would result in a substantial temporary and periodic increase in ambient noise levels in the project vicinity above levels existing and without the project. However, the project is not within a residential area, and the increase would be perceptible only to construction workers and maintenance workers; all personal protective equipment (PPE), such as ear protection, suggested by the construction manager and by the pump manufacturer would be worn at all times during operation of such equipment. Therefore, the increase does not result in a significant impact.

e) The well development area is not located within an airport land use plan, and is not within two miles of a public airport or public use airport.

f) The Action Alternatives are located approximately five miles from a private airstrip located in the community of Mendota; however, the activities associated with either

groundwater pumping or conservation/land fallowing activities would not expose people residing or working in the project area to excessive noise levels.

XIII. PUBLIC SERVICES	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less than Significant Impact	No Impact
Would the project:				
a) Result in substantial adverse physical impacts associated with the provision of new or physically altered governmental facilities, need for new or physically altered governmental facilities, the construction of which could cause significant environmental impacts, in order to maintain acceptable service ratios, response times or other performance objectives for any of the public services:			✓	
▪ Fire protection?			✓	
▪ Police protection?			✓	
▪ Schools?			✓	
▪ Parks?			✓	
▪ Other public facilities?			✓	

Discussion:

a) Generally, implementation of the Proposed Action or the Alternative Action without groundwater pumping would not result in additional demand for public services in the project area because population levels are expected to decrease relative to existing conditions in line with employment losses. For the Alternative Action with groundwater pumping, total employment is expected to increase slightly (about 45 jobs) relative to existing conditions. However, this alternative would not generate sufficient new jobs, and therefore permanent residents, in the region of about 1.8 million people that would measurably affect public service levels and/or place a burden on public service providers such that new facilities would be required. In addition, no features of the project would directly require additional public services. Further, construction activities associated with the Proposed Action are expected to affect the area in the immediate vicinity of the groundwater pumps and wells, and there are no major roads, schools, parks, or other public facilities in close proximity to proposed construction activities. Overall, impacts to public services are expected to be less than significant. Individual public services are addressed briefly below.

- Fire Protection: The only project feature that constitutes a fire hazard risk is the use of diesel fuel used for pumping groundwater. The risk of fire associated with diesel fuel use is low when following proper safety precautions. Further, no structures located in the vicinity of the proposed groundwater wells would be subject to fire hazard. Although not likely, in the case of accidental fires, Fire Station #96

(Mendota) of the Fresno County Fire Protection District would provide fire protection services.

- Police Protection: No criminal or other unlawful activity is expected as a result of the project such that police protection services would be required.
- Schools: No effect on schools would occur under the Proposed Action because population levels are expected to decline slightly. Under the Alternative Action with groundwater pumping, the limited amount and wide distribution of the 45 additional jobs and minor increases in related population growth under this alternative would result in a negligible amount of school-aged children requiring education services.
- Parks: Based on limited population growth under the Alternative Action with groundwater pumping, and population declines under the Proposed Action, additional use of local park resources would be negligible.
- Other Public Facilities: No other public services or facilities would be affected by the Proposed Action or Alternative Actions.

XV. TRANSPORTATION TRAFFIC	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less than Significant Impact	No Impact
Would the project:				
a) Cause an increase in traffic that is substantial in relation to the existing traffic load and capacity of the street system (i.e., result in a substantial increase in either the number of vehicle trips, the volume to capacity ratio on roads, or congestion at intersections)?			✓	
b) Exceed, either individually or cumulatively, a level of service standard established by the county congestion management agency for designated roads or highways?				✓
c) Result in a change in air traffic patterns, including either an increase in traffic levels or a change in location that results in substantial safety risks?				✓
d) Substantially increase hazards due to a design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., farm equipment)?				✓
e) Result in inadequate emergency access?				✓
f) Result in inadequate parking capacity?				✓

XV. TRANSPORTATION TRAFFIC	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less than Significant Impact	No Impact
g) Conflict with adopted policies, plans, or programs supporting alternative transportation (e.g., bus turnouts, bicycle racks)?				✓

Discussion:

a) Installation of the groundwater pumps (Proposed Action and Alternative Action) would cause a less than significant increase in traffic in and out of the project area. Operation of the engines for the pumps would require deliveries of diesel and aqueous ammonia, but would not cause a significant increase in traffic. The Alternative Action would not be expected to have an increase in traffic.

b) Implementation of the Action Alternatives would not be expected to exceed the level of service standard. Major roads that occur near the project area are SR 33 and Nees Avenue and Fairfax Avenue. None of these roads are expected to be impacted by the proposed water supply/water transfer project.

c) The Action Alternatives would have no impact on air traffic patterns, as the project will involve minor construction or soil management activities in an agricultural area.

d) None of the Action Alternatives would increase hazards due to a design feature or incompatible uses. Existing land uses would continue in the project area , and the Action Alternatives would not result in incompatible uses with agricultural land.

e) Access would be maintained during construction of the groundwater wells under the Proposed Action. No road closures are planned during construction or operation of the wells. Therefore, emergency access would be maintained.

f) No major parking areas are located in the project area. Therefore, the proposed water supply/water transfer project would not impact parking capacity.

g) The proposed water supply/water transfer project would not conflict with adopted policies, plans, or programs supporting alternative transportation, as the amount of vehicular traffic going in and out of the project area would be minimal. Access to alternative transportation would not be impaired as a result of the project.

XVI. UTILITIES AND SERVICE SYSTEMS	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less than Significant Impact	No Impact
Would the project:				
a) Exceed wastewater treatment requirements of the applicable Regional Water Quality Control Board?				✓
b) Require or result in the construction of new water or wastewater treatment facilities or expansion of existing facilities, the construction of which could cause significant environmental effects?			✓	
c) Require or result in the construction of new stormwater drainage facilities or expansion of existing facilities, the construction of which could cause significant environmental effects?				✓
d) Have sufficient water supplies available to serve the project from existing entitlements and resources, or are new or expanded entitlements needed?			✓	
e) Result in a determination by the wastewater treatment provider that serves or may serve the project that it has adequate capacity to serve the project's projected demand in addition to the provider's existing commitments?				✓
f) Be served by a landfill with sufficient permitted capacity to accommodate the project's solid waste disposal needs?			✓	
g) Comply with Federal, State, and local statutes and regulations related to solid waste?				✓

Discussion:

a) There would be no wastewater generated directly under the Proposed Action or Action Alternatives. The project would change agricultural irrigation practices and would affect the amount of irrigation drain water that collects in the underlying drain tile systems. These drain flows would be reduced as part of the Proposed Action; no change in the amount of irrigation water treatment is expected under the Alternative Action because no groundwater pumping is proposed. However, irrigation drain water is not treated in the same manner as municipal wastewater and is not processed by wastewater treatment

plants. As a result, no wastewater treatment requirements would be exceeded, no new or expanded wastewater treatment facilities would be required, and existing treatment facilities would not be affected. No adverse impacts would occur.

b) A discussion of wastewater treatment systems is presented in Item a. In terms of new water facilities, the Proposed Action would require the installation of roughly 15 new groundwater wells. The installation of wells would be performed in accordance with all applicable laws and regulations and no adverse environmental effects are anticipated. This impact is considered less than significant.

c) No features of the Proposed Action or Alternative Actions would result in increased stormwater flows. The project area is in agricultural use, and stormwater that reaches canals is used for crop production, while precipitation results in groundwater recharge. No new or expanded facilities would be required, and no impact would result.

d) The water that would be used within CCID would come from an area with shallow groundwater levels. The proposed water transfer project would lower water levels in those areas affected by shallow groundwater by pumping water from the upper aquifer, using it elsewhere within CCID, and freeing up other surface water from the DMC for transfer out of the Exchange Contractors service area. No new entitlements would be needed, and no impact would occur.

e) See item a.

f) The proposed water supply/water transfer project does not involve construction activities (outside of well installation), which would generate solid waste. Similarly, no solid waste is expected to be generated during ongoing operations whereby water is distributed through existing infrastructure. Indirectly, conservation projects (e.g., canal lining) implemented with the funds received by the Exchange Contractors for the water transfer could generate limited amounts of solid waste. This waste would be disposed of at the nearest local landfill, which is likely to be the City of Clovis Landfill in Fresno with a remaining capacity of over 2.6 million cubic yards as of 2001 (California Integrated Waste Management Board 2006). This impact is considered less than significant.

g) All solid waste generated by construction activities associated with the Proposed Action and Alternative Action would comply with Federal, State, and local statutes and regulations related to solid waste. No impact is expected.

4.9 Cumulative Impacts

Does either the Proposed Action or the two Alternative Actions have impacts that are individually limited (or less than significant) but cumulatively considerable? "Cumulatively considerable" means that the incremental effects of a project are considerable when viewed in connection with the effects of other current projects, past projects, and probable future projects. Cumulative impacts are discussed for each resource in previous sections, with a focus on the water development area, and are summarized here.

4.9.1 Air Resources

Based on the existing air quality conditions in the project area, the Proposed Action would have an incremental contribution to a cumulative effect. However, that contribution would not be cumulatively considerable based on the fact that the project would comply with "specific requirements in a previously approved plan…" (Remy et al., 1999). As required by the CAA, the SJVAPCD must develop attainment plans to demonstrate how they will comply with the standards for which they are nonattainment (PM and ozone). Subsequently, the District must propose and approve air quality regulations to address the pollution problems identified in the required attainment plans. The USEPA approved the 2003 PM_{10} Plan for the San Joaquin Valley. The approval by the USEPA helps to facilitate the emission reductions as proposed in the attainment plan. The current plan for ozone attainment is the 2002–2005 Rate of Progress Plan for San Joaquin Valley Ozone. A 2004 Extreme Ozone Plan was submitted to USEPA in November 2004 and is currently under review. Consequently, the incremental contribution of the Proposed Action to air quality problems in the region would not be cumulatively considerable based on the project's compliance with the SJVAPCD rules that are included as part of the ozone and PM attainment plans.

4.9.2 Biological Resources

A cumulative impact analysis takes into consideration impacts that may be created as a result of combining the Proposed Action with other related programs or projects, past, present or reasonably foreseeable future, that have impacts. Because no impacts to biological resources are expected, there would be no incremental effects to contribute to produce cumulatively considerable effects in the larger water receiving area. In the receiving water areas, current allocations plus the new transfer water would not result in additional lands coming under production or land conversion to urban uses.

The blended water would be used entirely within CCID. As described in Section 2.4, transfers of water to M&I recipients beyond existing contract amounts will not be made unless those recipients demonstrate the no land conversion and related circumstances or complete the compliance actions called for in Section 2.4.

4.9.3 Cultural Resources

The Proposed Action's incremental effects from well installation would be less than significant given mitigation measures to avoid disturbance to resources that could be present. Other projects in the region would most likely be able to mitigate for impacts, as well as comply with Section 106 of the NRHP for any water provided for new uses, and avoid cumulatively considerable impacts.

4.9.4 Hydrologic Resources

4.9.4.1 Groundwater

The incremental effects of the Proposed Action combined with associated effects in the water development area are not adverse or significant. The effect of pumping associated with other urban and agricultural activities in Madera County has been overdraft of groundwater

resources and migration of poor quality groundwater into CCID and Madera County. The Proposed Action and one Alternative Action would reduce the northeasterly migration of poor quality groundwater and lessen the deterioration of well water quality in these areas. In this manner, these two Action Alternatives do not contribute to a cumulatively considerable impact. The Alternative Action without Groundwater Pumping would reduce the percolation of irrigation water to groundwater due to the conservation measures, and it would eventually lessen migration of poor quality groundwater.

The water receiving areas' long-term contract renewal water supplies, when considered in combination with other past, present, and reasonably foreseeable future actions and projects, are unlikely to result in further adverse cumulative impacts to groundwater levels and quality when compared to the No Action Alternative and existing conditions in the San Luis Unit. Much of the cumulative effects arising from the combination of long-term contract renewals and other past and present activities have already occurred and are documented in the San Luis Unit Draft EIS as existing conditions and ongoing trends within the Affected Environment and/or No Action Alternative descriptions (Reclamation 2005c). The cumulative effects of the long-term contract renewals and the continued application of irrigation water to agricultural lands (and for M&I purposes) will contribute indirectly to the continuation of current groundwater conditions and future trends as a result of decisions to be made regarding the levels of deliveries that the CVP can provide as the CVPIA continues to be implemented. This is particularly true when considering cumulative impacts resulting from all other CVP projects under analysis in the OCAP in combination with long-term contract renewals—levels of deliveries will dictate potential levels of irrigation applications, which will in turn increase the amount of potential adverse groundwater impacts within San Luis Unit. If deliveries are curtailed, such effects will likely be proportionally reduced to the extent they are directly related to irrigation applications. Future drainage management, habitat restoration, land acquisition, land retirement, water conservation, and related CVP programs are expected individually and in combination with long-term contract renewals to reduce cumulative drainage and water quality impacts to receiving waters if implemented as intended. (Reclamation 2005c)

4.9.4.2 Surface Water

The incremental effects of the Proposed Action, combined with associated effects, on water quality (i.e., on salt loads) are not significant. However, water quality problems in the San Joaquin River watershed are well known and result from a variety of land uses: urban runoff, agricultural discharges from irrigation practices, and discharges from wetlands and wildlife refuges. Water quality regulatory requirements and projects affecting the San Joaquin River include the SWRCB Decision 1641, the New Melones Interim Operation Plan, Level 4 wildlife area water deliveries, the San Joaquin River Agreement (inclusive of VAMP), the Grassland Bypass Project through 2009, salt and boron TMDLS from the CVRWQCB, the TMDL for dissolved oxygen in the Stockton Deep Water Ship Channel, the RWQCB irrigated lands conditional waiver, the Westside Regional Drainage Plan, and the San Luis Drainage Feature Re-evaluation. Within this context of future discharge projects and programs to improve water quality, the incremental beneficial impact of the reduction in drainage discharge is not cumulatively considerable.

Approved and proposed water transfers by the Exchange Contractors and the interim and long-term contract renewals, when added to other past, present, and reasonably foreseeable future actions, will not create any additional cumulative impacts on surface water resources or quality. Water deliveries to San Luis Unit contractors will be but one of many competing demands on surface water resources available for diversion and delivery. Because south-of-Delta deliveries rely on several actions "upstream" of the San Luis Unit, long-term contract renewals in the San Luis Unit have limited opportunities to increase reliance on other south-of-Delta surface water resources. Agricultural sources of sedimentation, siltation and selenium affecting receiving waters will continue to be supported by some CVP surface water deliveries (Reclamation 2005c).

4.9.5 Land Use

There are no incremental impacts from supporting agricultural production on the affected lands which are currently under cultivation. The regional trend of conversion of agricultural land to other uses, especially urban uses, would not be exacerbated by any of the Action Alternatives. Temporary land fallowing associated with the Alternative Action without Groundwater Pumping has the potential for increased soil erosion, but land management practices can avoid any incremental effects to a potentially cumulative considerable problem.

The cumulative land use impacts of primary concern in the San Luis Unit and SCVWD are associated with ongoing growth pressures that threaten the long-standing agricultural land use base by converting agricultural lands to M&I and residential use. Any conversions from agricultural to M&I land use within the San Luis Unit and SCVWD would not be caused by the terms of the contract renewal, nor by actions of the CVP contractors including the proposed water transfer by the Exchange Contractors. Instead, such changes would be the result of individual and cumulative land use planning decisions of affected counties, cities, and individual landowners. Those decisions will be guided by state and possibly local laws that already or may further require cities and counties to demonstrate adequate water supplies for land development projects.

4.9.6 Socioeconomics

By themselves, the impacts estimated for the Action Alternatives are not significant for the four-county study area. The total amount of cropland harvested in the four counties in which the Exchange Contractors service area is located has changed little since 1990, but has varied as much as 35,000 acres per year. Thus, idling of up to 5,455 acres under the Alternative Action without Groundwater Pumping would be within the normal range of variation and would not be significant, all other factors unchanged.

For this study under the Alternative Action, the impacts of fallowing in the Exchange Contractors area would be offset by the payments for water sold and investment in groundwater extraction, conservation, and irrigation system improvements. At a regional level with extensive land retirement, similar reinvestments from water sold and increased production in other areas would avoid a cumulatively considerable effect.

4.10 Mandatory Findings of Significance

XVII. MANDATORY FINDINGS OF SIGNIFICANCE	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less than Significant Impact	No Impact
Does the project:				
a) Have the potential to degrade the quality of the environment, substantially reduce the habitat of a fish or wildlife species, cause a fish or wildlife population to drop below self-sustaining levels, threaten to eliminate a plant or animal community, reduce the number or restrict the range of a rare or endangered plant or animal or eliminate important examples of the major periods of California history or prehistory?			✓	
b) Have impacts that are individually limited, but cumulatively considerable? ("cumulatively considerable" means that the incremental effects of a project are considerable when viewed in connection with the effects of past projects, the effects of other current projects, and the effects of probable future projects)?			✓	
c) Have environmental effects that will cause substantial adverse effects on human beings, either directly or indirectly?				✓

Discussion:

a) Impacts on the physical environment for air and water are less than significant as explained in Sections 4.1.2.1 and 4.4.2. For the San Joaquin River, no salinity increases of outflows are anticipated. Furthermore, reductions in poor quality drainage water from the affected area are a benefit. Appendix C documents that there are no impacts to sensitive species or their habitats including wetlands. For cultural resources, the identified sites can be avoided. Well locations would be surveyed visually for the presence of cultural materials, and drilling crew members would be trained to identify buried cultural materials. No important examples of cultural resources would be eliminated.

b) All of the project effects under the Action Alternatives are incrementally insignificant and do not contribute to cumulatively significant impacts. The regional context in which the project occurs is subject to programs and regulatory requirements that would minimize the potential for cumulatively considerable adverse effects, and some resources

would have beneficial impacts resulting from these plans and programs. The Action Alternatives would not conflict with agricultural uses of the land or with the adjacent community of Firebaugh as explained in Sections 4.5.2 and 4.5.3. The potential for growth inducement is avoided as discussed in Section 4.5.5.

c) Section 4.6 indicates the socioeconomic impacts are not substantial, and Section 4.7 concludes there are no adverse impacts on environmental justice.

5.0 CONSULTATION AND COORDINATION

This section reviews agency consultation and coordination performed by Reclamation and the Exchange Contractors that occurred prior to and during preparation and review of the Environmental Assessment/Initial Study (EA/IS).

5.1 Federal Agencies Coordination

NEPA requires that Reclamation consult with Federal cooperating agencies. For the proposed groundwater pumping/water transfer project, the cooperating agency is the U.S. Fish and Wildlife Service (Service). Section 7(a)(2) of the Federal Endangered Species Act (ESA) requires Federal agencies to consult with the Service and/or NOAA Fisheries on any activities that may affect any Federally-listed or proposed to be listed species of plant or animal. If potential effects to listed or proposed species or their designated critical habitat are identified, these effects require the initiation of the Section 7 process.

Reclamation and the Service have met to initiate informal consultation for the proposed groundwater pumping/water transfer project (January 8, 2007). We have proposed a two phase ESA consultation, anticipating that water deliveries could begin in 2008 for the Proposed Action or any Alternative Action.

- Phase 1 would consist of consultation on impacts of the water being delivered for existing agriculture and M&I uses in San Luis, Westlands, Panoche, Pacheco and Santa Clara Valley Water Districts, for up to 20,000 AF delivered amongst the contractors. Reclamation could approve one or more 25-year water transfers to existing agriculture and M&I uses. Reclamation has determined that this action would have no effect on any Federally listed species or the habitats on which they depend.
- For any deliveries to M&I uses in excess of existing contract amounts, Phase 2 would consist of consultation of impacts and mitigation for 3,000 AF (of the 20,000 AF) to serve new proposed development ("Villages") within the San Luis Water District. In consideration of the Villages development schedule, it is anticipated that the Villages development will not call on the 3,000 acre feet until 2009 at the earliest, allowing Reclamation and the Service time to complete the Phase 2 ESA compliance including any San Joaquin kit fox mitigation requirements.

Any approval from Reclamation for deliveries to existing agriculture and M&I uses pursuant to Phase 1 will expressly preclude delivery of any such water to any new M&I development until all applicable NEPA and ESA requirements have been satisfied. This Phase 1 approval would not cover the Villages project in San Luis Water District which would involve site-specific land conversion. This land conversion will be evaluated separately under CEQA and NEPA.

The Service was contacted on June 19, 2007, to provide information about endangered and threatened species in the project area and provided a response that day (USFWS, 2007, pers. comm.). The Service has been provided copies of this EA/IS for review and comment.

Reclamation will lead the Section 106 (National Historic Preservation Act) process and determine whether the construction of new wells could affect any historic resources. Reclamation's findings will be reviewed with the SHPO and will consult with Indian Tribes if necessary.

All comments received will be considered prior to adoption of a Finding of No Significant Impact (FONSI).

5.2 State Agencies Coordination

CEQA requires that the Lead Agency must formally consult with responsible and trustee agencies, and this coordination was initiated with the distribution of the EA/IS to the State Clearinghouse. Copies were sent directly to agencies on the attached list including the Department of Fish and Game (DFG). All comments received will be considered prior to adoption of a Mitigated Negative Declaration by the Exchange Contractors and the CCID and FCWD Boards of Directors on the proposed groundwater pumping/water transfer project.

5.3 Public Involvement

The distribution of the Draft EA/IS to the agencies, organizations, and individuals for public comment was made to the list below.

1. Jerry Johns
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   P.O. Box 942836
   Sacramento, CA 94236-0001
2. Scott Jercich
   California Department of Water Resources
   State Water Projects Analysis Office
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3. Paula Landis
   California Department of Water Resources
   San Joaquin District
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4. Doug Denton
   California Department of Water Resources
   2440 Main Street
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5. Nadell Gayou
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6. Paul Dabbs, Room 252-7A
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   Statewide Planning Branch
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7. Lisa Hanf
   Environmental Protection Agency
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   Office of Federal Activities (CMD-3)
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8. Patricia S. Port
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9. EWA Program Manager
CALFED Bay-Delta Program
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10. Nick Wilcox
Division of Water Rights
State Water Resources Control Board
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11. Pamela Creedon
Regional Water Quality Control Board
Central Valley Region
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Rancho Cordova, CA 95670-6114

12. Dale Garrison
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2800 Cottage Way, Suite W2605
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13. Susan Moore
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14. Cay Goude
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15. Kim Forrest
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16. W.E. Loudermilk
Regional Manager
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1234 East Shaw Avenue
Fresno, CA 93710

17. John Beam
California Department of Fish & Game
22759 S. Mercy Springs Road
Los Banos, CA 93635

18. Robert Huddleston
Department of Fish & Game
Mendota Wildlife Area
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Mendota, CA 93640

19. Jerry Mensch
California Department of Fish & Game
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Sacramento, CA 95814

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